LGTP REPORT NO. 93-R-03
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QUALIFICATION TESTING OF THE MILSTAR CONTAINER GROUP

HQ AFMC/LGTPM
AIRFORCE PACKAGING EVALUATION ACTIVITY
WRIGHT-PATTERSON AFB, OH 45433-5999
March 1993

NOTICE

PROJECT NO. 92-P-111

TITLE: Qualification Testing of the MILSTAR Container Group

ABSTRACT

At the request of MSD/YJA, Eglin AFB, FL, the Air Force Packaging Evaluation Activity evaluated the MILSTAR container group to determine suitability for production release. The MILSTAR containers are intended to provide worldwide level A shipping and storage prctection for a communication contingency antenna system. Eight containers are welded aluminum, controlled breathing style with polyethylene foam inserts to provide required cushioning, blocking, and bracing of the antenna system components and with a removable cover. One container is an open head steel drum with polyethylene foam inserts and a controlled breathing valve. The container group was subjected to a level A shipping and storage rough handling test series in accordance with a YJA specified test plan.

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INTRODUCTION

At the request of MSD/YJA, Eglin AFB, FL, the Air Force Packaging Evaluation Activity evaluated the MILSTAR container group to determine suitability for production release. The MILSTAR containers are intended to provide worldwide level A shipping and storage protection for a communication contingency antenna system. The container group was subjected to a level A shipping and storage rough handling test series in accordance with a YJA specified test plan

ITEM DESCRIPTION

Eight containers are welded aluminum, controlled breathing style with polyethylene foam inserts to provide required cushioning, blocking, and bracing of the antenna system components and with a removable cover. One container is an open head steel drum with polyethylene foam inserts and a controlled breathing valve. Container exterior size, tare and gross weights, contained items description, and CNU number are lists in Table I of the Test Plan (Appendix 1). Photographs of the fully assembled container exterior and opened container interior showing its contents are presented in Appendix 2. Test loads are components of the contingency antenna system listed in Table I for each container. Hoisting and tiedown provisions are integral to the handle with the exception of the CNU-516 and CNU-526 which were fitted with four discrete tiedown rings. Removable covers were all secured to container bases with toggle quick release fasteners. The closure seam between the cover and base was sealed with a round rubber gasket and was fitted with mechanical stops at each corner to prevent excessive gasket compression. Initial inspection indicated that the containers were complete, suitable for test, and contained the items listed in Table I.

TEST EQUIPMENT

Item	Manufacturer	Model	Serial	Cal Exp
Accelerometer	Endevco	2233E	AY29	10 Oct 92
Charge Amplifier	Endevco	2740B		N/A
Storage Oscilloscope	Tektronix	5115	B94122	2 Jul 92
Vibration Meter	L.A.B. Div.	381A	0068	20 Apr 92
Vibration Machine	L.A.B. Div.	41012	89003	N/A
Overhead Hoist	Coffing	6000	N/A	N/A
Pendulum Impact Mach	Facility	5000	N/A	N/A
Forklift Truck	Mercury	401S	117774	N/A
Dynamometer	WC Dillon & Co	5000	20058	25 Sep 92
Halogen Leak Detector	General Elec	42081	9M09	N/A
Manometer, 0-60 in wt	Meriam Inst.	30EB25	154591	N/A

Vacuum Pump	Precision		
Platform Scale 2000#	Howe	N/A	A057229 4 Now 92
Platform Scale 2000#	Howe	N/A	A057232 4 Nov 92

TEST PROCEDURE

The containers configured as specified in the Test Plan were tested in accordance with the MSD/YJA test plan (Appendix 1) and referenced methods of MIL-STD-648A and Fed-Std-101C, except as stated herein. By permission of MSD/YJA, leak tests numbers 3, 5, 7, and 9 were omitted in order to reduce test time. Leak tests numbers 1 and 11 were performed.

TEST RESULTS

Test 1, Fed-Std-101C, Method 5009.1, Leaks in Containers, 6.3, Pneumatic Pressurization Technique.

Container	Pressure (psi)	Pressure Loss (psi)	Time (min)	Leak Rate (psi/hour)	Status
CNU-510	1.52	0.00	15	0.00	Pass
CNU-516	1.52	0.00	15	0.00	Pass
CNU-518	2.02	0.0072	60	0.0072	Pass
CNU-519	2.01	0.0072	64	0.0067	Pass
CNU-520	2.04	0.0108	30	0.022	Pass
CNU-521	1.99	0.029	60	0.029	Pass
CNU-526(1)	Slight	All	15	High	Failed
CNU-529	2.03	0.0108	60	0.0108	Pass
CNU-530	2.01	0.029	60	0.029	Pass
CNU-526M(2)	1.99	0.32	60	0.32	Failed

NOTE 1: When tested with latches adjusted as received which were as recommended by ASD/YJA with an opened latch container angle of approximately 45 degrees, retested with the opened four corner latch container angles adjusted to 70 degrees for maximum latch draw, and finally retested with the closed latches wrench tightened to cause cover and base mechanical stops to bear, the CNU-526 container leaked at four corners and both ends through the gasketed closure seam at a very high rate. A lengthwise concave weld induced distortion in the plane of the top of the container cover was noted as being the cause.

NOTE 2: The CNU-526M consisted of the CNU-526 container shell and UHF antenna mast with a modified set of cushioning pads installed. With an opened latch container angle of approximately 70 degrees for maximum latch draw, the CNU-526M container would not pressurize. Upon wrench tightening the closed latches to the degree that they would not open, but cover base mechanical stops did not bear, the CNU-526M

container would not pressurize due to excessive leakage at the forward end closure seam. Further tightening of the latches to bearing of the cover base mechanical stops allowed pressurization, but the container could not be opened using the toggle action quick release feature of the latch. Excessive leakage occurred through the gasketed closure seam at corners 2-6, 4-5, and 4-6 as indicated by a halide leak detector and injection of the container with haloid to 10 inches of water followed by pressurization to 2.0 psi with air.

Test 2, MIL-STD-648A, 5.3.2, Resonance Strength and Dwell Test, Ambient Temperature.

Container	Resonant Frequency (Hz)	Dwell Time (Min)	Status
CNU-510	12.0	30	Passed
CNU-516	12.3	30	Passed
CNU-518	11.8	30	Passed
CNU-519	12.4	30	Passed
CNU-520	12.4	30	Passed
CNU-521	12.0	30	Passed
CNU-526			Not Tested
CNU-529	12.4	30	Passed
CNU-530	12.2	30	Passed

Post test examination was by visual inspection of the container interior and exterior and the contained items. The container, welds, cushioning, contained items, and item bags when present were inspected for damage. The item was inspected for rotation or translation that might result in damage to either the container or the item. Latches were inspected for opening during test. To pass, any of the above conditions may not be sustained. Containers which passed conform to the requirements imposed by MIL-STD-648A, 5.3.2.

Test 3, Fed-Std-101C, Method 5005.1, Cornerwise Drop (Rotational) Test.

Container	Drop Height (Inches)	Corners Impacted	Status
CNU-510	24	4	Passed
CNU-516	24	4	Passed
CNU-518	24	4	Passed
CNU-519	24	4	Passed
CNU-520	24	4	Passed
CNU-521			Not Tested

CNU-526			Not Tested
CNU-529	24	4	Passed
CNU-530	24	4	Passed

Post test examination was by visual inspection of the container interior and exterior and the contained items. The container, welds, cushioning, contained items, and item bags when present were inspected for damage. The item was inspected for rotation or translation that might result in damage to either the container or the item. Latches were inspected for opening during test. For impacted corners, minor inelastic deformation at bearing areas involving corner weldments was incurred for all containers. At the time of test, visual inspection did not reveal weld deterioration due to cracking; however, subsequent leak testing for the CNU-529 and CNU-530 containers failed. The impacted corner deformation clearly did not impair container performance or function, and at most, constituted an apparent blemish. Containers which passed conform to the requirements imposed by Fed- Std-101, Method 5005.1, and contain no critical defects for which inspected.

Test 4, Fed-Std-101C, Method 5008.1, Edgewise Drop (Rotational) Test.

Container	Drop Height (Inches)	Edges Impacted	Status
CNU-510	24	4	Passed
CNU-516	24	4	Passed
CNU-518	24	4	Passed
CNU-519	24	4	Passed
CNU-520	24	4	Passed
CNU-521			Not Tested
CNU-526			Not Tested
CNU-529	24	4	Passed
CNU-530	24	4	Passed

Post test examination was by visual inspection of the container interior and exterior and the contained items. The container, welds, cushioning, contained items, and item bags when present were inspected for damage. The item was inspected for rotation or translation that might result in damage to either the container or the item. Latches were inspected for opening during test. To pass, any of the above conditions may not be sustained. Containers which passed conform to the requirements imposed by Fed-Std-101C, Method 5008.1.

Test 5, Fed-Std-101C, Method 5012, Pendulum Impact Test.

Container	Impact Velocity (ft/sec)	Sides Impacted	Status
CNU-510	7	4	Passed
CNU-516	7	4	Failed (1)
CNU-518	7	4	Passed
CNU-519	7	4	Passed
CNU-520	7	4	Passed
CNU-521			Not Tested
CNU-526			Not Tested
CNU-529	7	4	Passed
CNU-530	7	4	Passed

Post test examination was by visual inspection of the container interior and exterior and the contained items. The container, welds, cushioning, contained items, and item bags when present were inspected for damage. The item was inspected for rotation or translation that might result in damage to either the container or the item. Latches were inspected for opening during test. To pass, any of the above conditions may not be sustained. Containers which passed conform to the requirements imposed by Fed-Std-101C. Method 5012.

Note 1: The CNU-516 container failed due to shearing of the glue seam attaching the small cylindrical cushion pad that inserts into the base assembly top axial hole to the larger cylindrical cushion pads of the top cushion assembly. If the small cushion pad was intended to provide base assembly restraint in the horizontal plane, it failed to do so.

Test 6, Fed-Std-101C, Method 5007.1, Free Fall Drop Test.

Container	Drop Height (Inches)	Surface Impacted	Status
CNU-510	24	Bottom	Passed
CNU-516	24	Bottom	Passed
CNU-518	24	Bottom	Passed
CNU-519	24	Bottom	Passed
CNU-520	24	Bottom	Passed
CNU-521	24	Bottom	Failed
CNU-526			Not Tested
CNU-529	24	Bottom	Passed
CNU-530	24	Bottom	Passed

Post test examination was by visual inspection of the container interior and exterior and the contained items. The container, welds, cushioning, contained items, and item bags when present were inspected for damage. The

item was inspected for rotation or translation that might result in damage to either the container or the item. Latches were inspected for opening during test. To pass, any of the above conditions may not be sustained. Containers which passed conform to the requirements imposed by Fed-Std-101C, Method 5007.1.

The CNU-521 drum failed the 24 inch flat bottom and four bottom quadrant drop test due to subsequent leak test failure and the shearing of the glue seam bonding the small cylindrical cushion pad that inserts into the top hole of the EHF antenna riser to the larger cylindrical cushion pad of the top cushion assembly. If the small cylindrical cushion pad was intended to provide EHF antenna riser restraint in the plane perpendicular to its axis, it failed to do so.

Test 7, Fed-Std-101C, Method 5009.1, Leaks in Containers, 6.3, Pneumatic Pressurization Technique.

Container	Pressure (psi)	Pressure Loss (psi)	Time (min)	Leak Rate (psi/hour)	Status
CNU-510	1.50	0.022	60	0.022	Passed
CNU-516	1.58	0.011	60	0.011	Passed
CNU-518	2.01	0.004	60	0.004	Passed
CNU-519	1.99	0.0397	60	0.0397	Passed
CNU-520	2.08	0.011	60	0.011	Passed
CNU-521	2.00	0.076	60	0.076	Failed
CNU-526					Not Tested
CNU-529	2.03	0.119	60	0.119	Failed
CNU-530	2.05	0.054	60	0.054	Failed

The CNU-521 container failed the post drop test leak test due to deformation and opening of the roll formed seam attaching the drum bottom to the cylindrical body resulting from the four quadrant drops at the impact bearing areas. The measured leak rate was 0.076 psi/hr while the requirement was that the leak rate shall not exceed 0.04 psi/hr. With injection of 2.1 inches of water of haloid and pressurization of the drum to 2.0 psig, a sensitive electronic halide leak detector indicated leaks at each of the deformed bottom rim seam areas. The top closure did not leak. No other leaks were detected.

Both CNU-529 and CNU-530 containers failed the post drop test leak test due to excessive leakage at one or more locations in the closure gasket. For the CNU-529, the measured leak rate was 0.12 psi/hr. For the CNU-530, the measured leak rate was 0.054 psi/hr. Examination of the closure gasket with bubble forming soap solution leak detector was not sufficiently sensitive to indicate a leak for either

container. Examination of both containers pressurized to their respective leak test pressures after injection of 10 inches of water of haloid by means of an electronic halide leak detector indicated leakage at one or more locations in the closure gasket seam. The halide leak detector also indicated leakage for both containers at one or more bottom corners impacted by cornerwise drop testing; however, subsequent testing by ASD/YJA using helium injection and a helium leak detector indicated that no leakage occurred at the bottom corners (see Attachments 4 and 7).

Test 8, Fed-Std-101C, Method 5016.1, Superimposed Load Test (Stackability, with Dunnage).

Container	Superimposed Load (pounds)	Duration of Load (min)	Status
CNU-510	2370	60	Passed
CNU-516	3800	60	Passed
CNU-518	3732	60	Passed
CNU-519	3732	60	Passed
CNU-520	2430	60	Passed
CNU-521	1660	60	Passed
CNU-526			Not Tested
CNU-529	3898	60	Passed
CNU-530	4382	60	Passed

To pass, each container supported its respective superimposed load for a duration of 1 hour without sustaining permanent deformation or functional damage and without causing damage to its contents. Containers which passed conform to the requirements imposed by Fed-Std-101C, Method 5016.1.

Test 9, MIL-STD-648A, 5.8.3, Hoisting Fitting Strength Test.

Container	Fitting	Superimposed Load (pounds)	Duration of Hanging (min)	Status
CNU-510	4 Top Handles	1570	5	Passed
	4 Bot Handles		5	Passed
CNU-516	4 Tiedown Rings	1907	5	Passed
	4 Top Handles	1907	5	Passed
	4 Bot Handles	1907	5	Passed
CNU-518				No Test
CNU-519				No Test
CNU-520	2 Bot Handles	870	5	Passed
CNU-521	4 Vert Handles	1885	5	Failed
	4 Horiz Handles	1885	5	Failed
CNU-526				No Test
CNU-529				No Test
CNU-530				No Test

Evaluation of the CNU-510, CNU-516, CNU-520, and CNU-521 containers for hoisting fitting strength, evaluated handle sizes and configurations and tiedown rings that could be used as hoisting fittings. Handles were fabricated from 3/4 inch diameter aluminum rod and fitted in nominal 11.5 or 17.0 inch width recessed slots in the container exterior wall for aluminum containers. For the CNU-521 steel drum, the handles were formed steel wire, four for upright carriage and four for carriage with the drum cylindrical axis horizontal. In addition to four 17 inch slot width top and four 11.5 inch slot width bottom handles, the CNU-516 container featured four 2.5 inch tiedown rings. To pass, the container may not incur failure or permanent deformation of any part of the hoisting or tiedown structure, or create any unsafe handling condition or dangerous handling practice. As the untested containers featured nominally identical hoisting fittings to those tested, test results for similar hoisting fittings infer the status of the untested container hoisting fittings. For the CNU-521 steel drum in the upright position, three of four handles are deformed to the extent that two will not retract flat against the container wall. For the CNU-521 steel drum in the horizontal position, four of four handles are deformed and will not retract flat against container wall. The containers which passed comply with the requirements of MIL-STD-648A, 5.8.3.

Test 10, MIL-STD-648A, 5.8.5, Single Hoisting Fitting Strength Test.

Container	Fitting	Duration of Hanging (min)	Status
CNU-510	Handles:		
	Top, Side 6, Corner 2-6	5	Passed
	Top, Side 6, Corner 4-6	5	Passed
	Top, Side 5, Corner 2-5	5	Passed
	Top, Side 5, Corner 4-5	5	Passed
	Bottom, Side 6, Corner 2-6	5	Passed
	Bottom, Side 6, Corner 4-6	5	Passed
	Bottom, Side 5, Corner 2-5	5	Passed
	Bottom, Side 5, Corner 4-5	5	Passed
CNU-516	Handles:		
	Top, Side 6, Corner 2-6	5	Passed
	Top, Side 6, Corner 4-6	5	Passed
	Top, Side 5, Corner 2-5	5	Passed
	Top, Side 5, Corner 4-5	5	Passed
	Bottom, Side 6, Corner 2-6	5	Passed
	Bottom, Side 6, Corner 4-6	5	Passed
	Bottom, Side 5, Corner 2-5	5	Passed
	Bottom, Side 5, Corner 4-5	5	Passed
	Tiedown Rings:		
	Bottom, Side 4, Corner 4-6	5	Passed
	Bottom, Side 4, Corner 4-5	5	Passed

	Bottom, Side 2, Corner 2-5	5	Passed
	Bottom, Side 2, Corner 2-6	5	Passed
CNU-518			No Test
CNU-519			No Test
CNU-520	Handles:		
	Bottom, End 5, Center	6	Passed
	Bottom, End 6, Center	5	Passed
CNU-521	Upright Carriage Handle:		
	1	5	Passed
	2	5	Passed
	3	5	Passed
	4	5	Passed
	Horizontal Carriage Handle:		
	5	5	Passed
	6	0	Failed
	7	5	Passed
	8	5	Passed
CNU-526			No Test
CNU-529			No Test
CNU-530			No Test

Evaluation of the CNU-510, CNU-516, CNU-520, and CNU-521 containers for single hoisting fitting strength, evaluated handle sizes and configurations and tiedown rings that could be used as hoisting fittings. Handles were fabricated from 3/4 inch diameter aluminum rod and fitted in nominal 11.5 or 17.0 inch width recessed slots in the container exterior wall for aluminum containers. For the CNU-521 steel drum, the handles were formed steel wire, four for upright carriage and four for carriage with the drum cylindrical axis horizontal. In addition to four 17 inch slot width top and four 11.5 inch slot width bottom handles, the CNU-516 container featured four 2.5 inch tiedown rings. To pass, the container may not incur failure or permanent deformation of any part of the hoisting or tiedown structure, or create any unsafe handling condition or dangerous handling practice. As the untested containers featured nominally identical hoisting fittings to those tested, test results for similar hoisting fittings infer the status of the untested container hoisting fittings. For the CNU-521 steel drum in the horizontal position, handle 6 pulled from its socket on one side and deformed by opening during hoisting. The containers which passed comply with the requirements of MIL-STD-648A, 5.8.5.

Except for the CNU-521, container identification numbering is: Side 5 contains relief valve and handles. Side 6 is opposite side 5. Side 4 is 90 degrees clockwise to side 5. Side 2 is opposite side 4.

For the CNU-521 drum, handle and quadrant numbering about the cylindrical axis is clockwise assignment of the numbers 1, 2, 3, and 4 with the breather valve being between 3 and 4 and with the drum upright. For horizontal carriage handles:

5 is above 2, 6 is below 2, 7 is above 4, and 8 is below 4.

Test 11, MIL-STD-648A, 5.8.4, Tiedown Strength Test.

Container	Sequence	Tiedown Set	Load Side	Applied Load (lbs)	Time (min)	Required Load	Status
CNU-510		Handles:					
	1	Lower	2	940	0	942	Failed
	2	Lower	6	780	0	942	Failed
	3	Lower	4	770	0	942	Failed
	4	Lower	5	880	0	942	Failed
	5	Upper	5	940	1	942	Failed
	6	Upper	6	930	0	942	Failed
	7	Upper	4	630	0	942	Failed
	8	Upper	2	570	0	942	Failed
CNU-510M (see Appendix 6 for test results)							Failed
CNU-516	1	Ring	6 fwd	1150	1	1134	Passed
	2	Ring	5 aft	1160	1	1134	Passed
	3	Ring	2 lat	600	1	567	Passed
	4	Ring	4 lat	580	1	567	Passed
CNU-518		Handle					No Test
CNU-519		Handle					No Test
CNU-520		Handle					No Test
CNU-521		Handle					No Test
CNU-526		Ring					No Test
CNU-529		Handle					No Test
CNU-530		Handle					No Test

With the container secured in the required X pattern tiedown configuration which is one chain in each of four tiedown fittings with the chain making an angle of 45 degrees with respect to the horizontal and the container side, and supported by orthogonal rollers to allow unrestricted movement in the horizontal plane, the stated tensile load was applied perpendicular to the specified face to simulate restraint loading. To pass, the container may not incur failure or permanent deformation of any part of the hoisting or tiedown structure, or create any unsafe handling condition or dangerous handling practice. As the untested containers featured nominally identical hoisting fittings to those tested, test results for similar hoisting fittings infer the status of the untested container hoisting fittings.

The CNU-521 being degraded by previous testing was not tested as it was unsuitable for this test. Both the unmodified CNU-510 and the modified CNU-510M failed the tiedown test either because, one or more handles were pulled from retaining sockets at one or both handle ends for each test sequence without sustaining the required load for 1 minute,

or one or more handles incurred inelastic deformation for each test sequence (see Appendices 4 and 6). For the unmodified CNU-510 container, the following handle tiedown failures were observed for test sequence: 1, side 6, corner 4-6 handle was pulled from its interior side socket and incurred inelastic deformation; 2, side 5, corner 4-5 handle was pulled from its interior side socket and incurred inelastic deformation; 3, side 5, corner 2-5 handle pulled from its interior socket and incurred small inelastic deformation; 4, side 6, corner 4-6 handle pulled from its interior socket and incurred inelastic deformation; 5, side 6, handles 4-6 and 2-6 incurred inelastic deformation; 6, side 5, handles 4-5 and 2-5 pulled from their interior sockets and incurred inelastic deformation; 7, side 5, corner 2-5 handle pulled from its interior socket and incurred inelastic deformation to the extent that it would not retract into its recess; 8, side 5, corner 4-5 handle pulled from its interior socket and incurred inelastic deformation to the extent that it would not retract into its recess. Containers with tiedown rings, CNU-516 and CNU-526, comply with the requirements of MIL-STD-648A, 5.8.4.

Test 12, MIL-STD-648A, 5.5, Structural Integrity Test.

Container	Pressure (psi)	Time Pres (min)	Vacuum (psi)	Time Vac (min)	Status
CNU-510	+2.00	5	-1.00	5	Passed
CNU-516	+2.00	5	-1.00	5	Passed
CNU-518	+2.50	5	-1.50	5	Passed
CNU-519	+2.50	5	-1.50	5	Passed
CNU-520	+2.50	5	-1.50	5	Passed
CNU-521	+2.50	5	-1.50	5	Passed
CNU-526					No Test
CNU-529	+2.50	5	-1.50	5	Passed
CNU-530	+2.50	5	-1.50	5	Passed

To pass for the pressure test, the container shall not incur failure of the latches, fasteners, or container structure in such a way as to cause any unsafe condition, or permanent container structural deformation which prevents removal of the contents. To pass for the vacuum test, the container shall not incur permanent structural deformation.

CONCLUSIONS

Results of test have been reported in a definitive manner and as to whether or not the container complied with the requirements stated and implied by the respective tests. MSD/YJA, Eglin AFB, FL will decide the suitability of each container for use and the possible remedial action to correct any deficiencies indicated by test.

DISTRIBUTION LIST

DTIC/FDAC CAMERON STATION ALEXANDRIA VA 22304-6145	12
HQ AFMC/LG WRIGHT-PATTERSON AFB OH 45433-5999	1
HQ AFMC/LGT WRIGHT-PATTERSON AFB OH 45433-5999	1
HQ AFMC/LGTP (LIBRARY) WRIGHT-PATTERSON AFB OH 45433-5999	10
HQ USAF/LGTT WASHINGTON DC 20330	1
OC-ALC/DST TINKER AFB OK 73145-5000	1
OC-ALC/DSTD TINKER AFB OK 73145-5000	1
OO-ALC/TID HILL AFB UT 84056-5000	1
OO-ALC/TIDTL HILL AFB UT 84406	1
SA-ALC/DST KELLY AFB TX 78241	1
SA-ALC/DSTD KELLY AFB TX 78241	1
SM-ALC/TID MCCLELLAN AFB CA 95652-5000	1
SM-ALC/TIDTD MCCLELLAN AFB CA 95652-5000	1
SM-ALC/TIDTL MCCLELLAN AFB CA 95652-5000	1
WR-ALC/DST ROBINS AFB GA 31098-5000	1

WR-ALC/DSTD 1
ROBINS AFB GA 31098-5000

ASC/AWL 1
WRIGHT-PATTERSON AFB OH 45433

ASC/ALXS 1
WRIGHT-PATTERSON AFB OH 45433

ASC/YJA 5
EGLIN AFB FL 32542

GSA OFFICE OF ENGINEERING MGT 1
PACKAGING DIVISION
WASHINGTON DC 20406

COMMANDER 1
ATTN: N KARL (SUP 045)
NAVAL SUPPLY SYSTEMS COMMAND
WASHINGTON DC 20376-5000

COMMANDER 1
ATTN: E PANIGOT (AIR 41212A)
NAVAL AIR SYSTEMS COMMAND
WASHINGTON DC 20361

COMMANDER 1
ATTN: T CORBE (CODE 8218)
SPACE AND NAVAL WARFARE SYSTEMS COMMAND
WASHINGTON DC 20360

ATTN: C MANWARRING (FAC 0644) 1
NAVAL FACILITIES ENGINEERING COMMAND
HOFFMAN BLDG 2 ROOM 12S21
ALEXANDRIA VA 22332

COMMANDING OFFICER 1
ATTN: K POLLOCK (CODE 15611K)
NAVAL CONSTRUCTION BATTALION CENTER
PORT HUENEME CA 93043

COMMANDER 1
NAVAL SEA SYSTEMS COMMAND
ATTN: G MUSTIN (SEA 66P)
WASHINGTON DC 20362

COMMANDER 1
ATTN: F BASFORD (SEA 05M3)
NAVAL SEA SYSTEMS COMMAND
WASHINGTON DC 20362

ATTN: J YANNELLO (CODE EPP-A) 1
NAVAL AVIATION SUPPLY OFFICE
700 ROBBINS AVENUE
PHILADELPHIA PA 19111-5098

ATTN: F SECHRIST (CODE 0541) 1
NAVY SHIPS PARTS CONTROL CENTER
PO BOX 2020
MECHANICSBURG PA 17055-0788

COMMANDING OFFICER 1
ATTN: F MAGNIFICO (SESD CODE 9321)
NAVAL AIR ENGINEERING CENTER
LAKEHURST NJ 08733-5100

COMMANDING OFFICER 1
NAVAL WEAPONS STATION EARLE
NWHC/CODE 8023
COLTS NECK NJ 07722-5000

US AMC PACKAGING STORAGE AND 1
CONTAINERIZATION CENTER/SDSTO-TE-E
11 MIDWAY ROAD
TOBYHANNA PA 18466-5097

DLSIE/AMXMC-D 1
US ARMY LOGISTICS MGT CTR
FT LEE VA 23801-6034

ATTN: Mike Ivankoe 1
US ARMY ARDEC/SMCAR-AEP
DOVER NJ 07801-5001

US ARMY NATICK LABS/STRNC-ES 1
NATICK MA 01760

HQ AFMC/LGSH 1
WRIGHT-PATTERSON AFB OH 45433

ASC/SDM 1
WRIGHT-PATTERSON AFB OH 45433

ATTN: DLA-OWP 1
DEFENSE LOGISTICS AGENCY
CAMERON STATION
ALEXANDRIA VA 22304-6100

ATTN: DLA-AT 1
DEFENSE CONTRACT MANAGEMENT COMMAND
CAMERON STATION
ALEXANDRIA VA 22304-6190

AGMC/DSP NEWARK AFS 43057-5000	1
AMARC/DST DAVIS MONTHAN AFB AZ 85707-5000	1
645 TRANS/LGT WRIGHT-PATTERSON AFB OH 45433-5001	1
HQ PACAF/LGTT HICKAM AFB HI 96853-5000	1
HQ USAFE/LGTT APO NEW YORK 09094-5000	1
HQ ACC/LGTT LANGLEY AFB VA 23665-5001	1
HQ AFSPACECOM/LKT PETERSON AFB CO 80914-5000	1
HQ ANGSC/LGTT ANDREWS AFB MD 20331-6008	1
HQ ATC/LGTT RANDOLPH AFB TX 78150-5001	1
AFISC/SEWV NORTON AFB CA 92409-7001	1
HQ AU/LGTT MAXWELL AFB AL 36112-5001	1
HQ AMC/XONC SCOTT AFB IL 62225-5001	1
SCHOOL OF MILITARY PACKAGING TECHNOLOGY ATSZ-MP ABERDEEN PROVING GROUND MD 21005-5001	1
HQ USMC (CPP-2) WASHINGTON DC 20380	1
ATTN: DGSC/QED DEFENSE GENERAL SUPPLY CENTER 8100 JEFFERSON DAVIS HIGHWAY RICHMOND VA 23297-5000	1
ATTN: DGSC/OMAD DEFENSE GENERAL SUPPLY CENTER 8100 JEFFERSON DAVIS HIGHWAY RICHMOND VA 23297-5000	1

APPENDIX 1

TEST PLAN

TEST PLAN

Contingency Antenna System Containers (MILSTAR) - Nonfragile Items

1.0 OBJECTIVE

The objective of these tests is to qualify the containers (see table I) for production release.

2.0 DESCRIPTION

The containers are welded aluminum, controlled breathing style with a removable cover. The exception is the CNU-521/E container which is a metal drum.

3.0 PASS/FAIL CRITERIA

The contents or the containers must not have any functional or structural damage that would prevent further use.

4.0 INSTRUMENTATION

The items will not be instrumented with accelerometers during the test series. audio and visual methods will be used, when required, to determine peak hardware responses.

5.0 TEST SEQUENCE NUMBER AND DESCRIPTION

Unless otherwise specified the test sequence will be conducted as indicated in table II. The YJEM test engineer may authorize deviations to expedite the test series.

6.0 TEST FACILITY AND REPORT

The tests as listed in table II will be conducted at a test facility approved by YJEM, Eglin AFB, Florida. The data for each completed test container will be reviewed and a verbal pass or fail will be given to YJEM within 5 days after test completion. A written test report (letter format is acceptable) will be prepared and submitted to YJEM within 30 days after test completion. The report will contain, but is not limited to, tests conducted, criteria, test data with photographs, charts, or drawings, as appropriate.

TABLE I

MILSTAR Contingency Antenna System Containers

CNU-NUMBER	NOMENCLATURE	SIZE (Inch) L x W x Ht.	WEIGHT, POUNDS TARE ------- -GROSS	TEST LOAD POUNDS
CNU-510/E	UHF Antenna, Antenna, Single Pack	45x45x32	215	
			314	2355
CNU-516/E	Base Assembly Base Weldment Waveguide Pressurization Unit, Cylinder/ Pressurized Gas	50x50x25	215	
			378	3402
CNU-518/E	Site IKEE Waveguide Reel W/Cable	41x41x17	131	
			240	3600
CNU-519/E	Site IKEE Site Cable Reel Set	41x41x17	131	
			240	3600
CNU-520/E	UHF Antenna Antenna Drive, Single Pack	42x18x19	89	
			176	2376
CNU-521/E	EHF Antenna Riser	43 Dia x 49 (Drum)	175	
			380	1710
CNU-526/E	UHF Antenna Mast, Single Pack	103x17x15	164	
			228	3762
CNU-529/E	Site IKEE Ground Anchor Kit Grounding Rod Kit	48x23x13	87	
			188	3666
CNU-530/E	Base Assembly Baseplate, Out-Rigger Assy, Tensioning Tower Assy	43x36x15	131	
			248	4092

Table II Test Sequence Number and Description

SEQ.	DESCRIPTION	STD	METHOD/ PARA	°F
1.	LEAK TEST - The pressure monitor must have an accuracy of at least ± 0.005 psig. Pressurize container and monitor for 15 minutes. If no loss terminate the test. If loss continue for a total time of 60 minutes. Total loss cannot exceed 2 percent of test pressure. Note: See table III for each container starting and maximum pressure loss.	FTMS-101C	5009.1 6.3	AMB
2.	VIBRATION TEST - Sweep from 5-50 Hz 30 minute dwell at peak resonance. Vertical axis only.	MIL-STD-648A	5.3.2	AMB
3.	LEAK TEST - Same conditions as Test No 1.	FTMS-101C	5009.1 6.3	AMB
4.	CORNERWISE DROP TEST - All four corners at 24 inches. (Note: The CNU-521/E Drum is exempt from this test.)	F[CS-101C	5005.1	
5.	LEAK TEST - Same conditions as Test No. 1.	FTMS-101C	5009.1 6.3	AMB
6.	EDGEWISE DROP TEST - All four edges at 24 inches. (Note: The CNU-521/E Drum is exempt from this test.)	FTMS-101C	5008.1	
7.	LEAK TEST - Same conditions as Test No. 1.	FTMS-101C	5009.1 6.3	AMB
8.	PENDULUM IMPACT TEST All four sides at 7 feet	FTMS-101C	5012	

	per second. (Note: The CNU-521/E Drum is exempt from this test.)			
9.	LEAK TEST - Same conditions as Test No. 1.	FTMS-101C	5009.1 6.3	AMB
10.	DROP TEST - Drop each container including the CNU-521/E drum, flat on the bottom from 24 inches. Also, drop the CNU-521/E drum on the bottom edge, once on each of the four quadrants.	FTMS-101C	5009.1	
11.	LEAK TEST - Same conditions as Test No. 1	FTMS-101C	5009.1 6.3	AMB
12.	SUPERIMPOSED LOAD TEST (See table I for test loads)	FTMS-101C	5016.1	AMB
13.	HOISTING FITTING STRENGTH TEST Add test load. Lift off the floor using the intended fittings and hang for 5 minutes.	MIL-STD-648A	5.8.3	AMB
14.	SINGLE HOISTING FITTING STRENGTH TEST -	MIL-STD-648A	5.8.5	AMB
15.	TIEDOWN STRENGTH TEST - Secure the container using the intended tiedown points. The angle of restraint shall be 45 degrees from the horizontal and 45 degrees outboard from the container surface. Apply applicable load for each container for 1 minute. Forward - 3 g's Aft - 3 g's Lateral - 1.5 g's	MIL-STD-648A	5.8.4	AMB

Table III

MILSTAR Container Test Values (psig)

Container No.	Leak Test criteria Pressure	Max. Loss	Structural Integrity Test Pressure	Vacuum
CNU-510/E	1.500	.030	+2.000	-1.000
CNU-516/E	1.500	.030	+2.000	-1.000
CNU-518/E	2.000	.040	+2.500	-1.500
CNU-519/E	2.000	.040	+2.500	-1.500
CNU-520/E	2.000	.040	+2.500	-1.500
CNU-521/E	2.000	.040	+2.500	-1.500
CNU-526/E	2.000	.040	+2.500	-1.500
CNU-529/E	2.000	.040	+2.500	-1.500
CNU-530/E	2.000	.040	+2.500	-1.500

APPENDIX 2

FIGURES

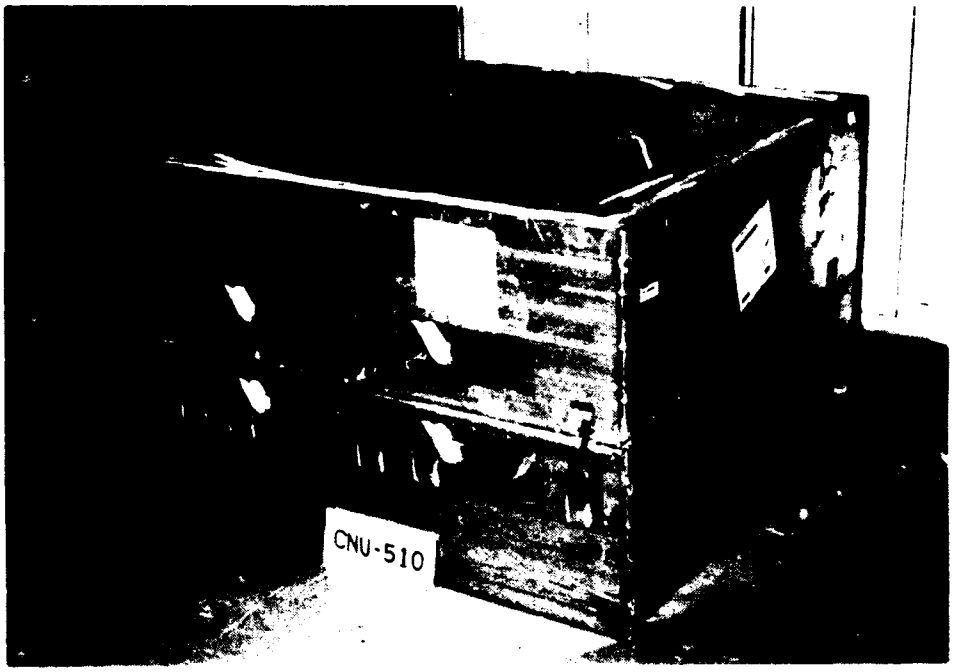


Figure 1. CNU-510/F Container.

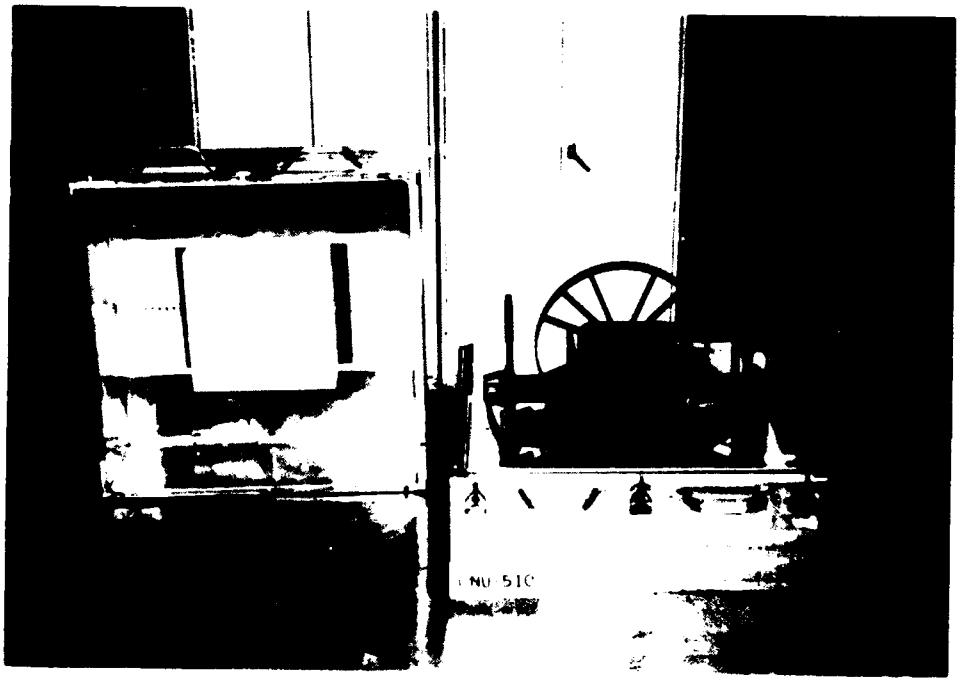


Figure 2. CNU-510/F Container, Open, Showing UHF Antenna.

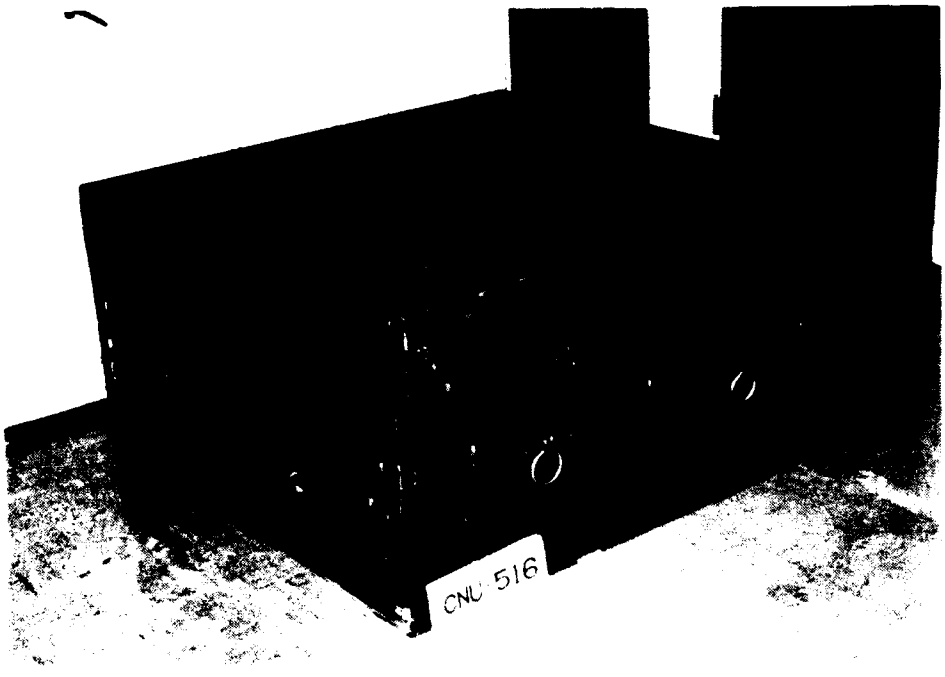


Figure 3. CNU-516/E Container.

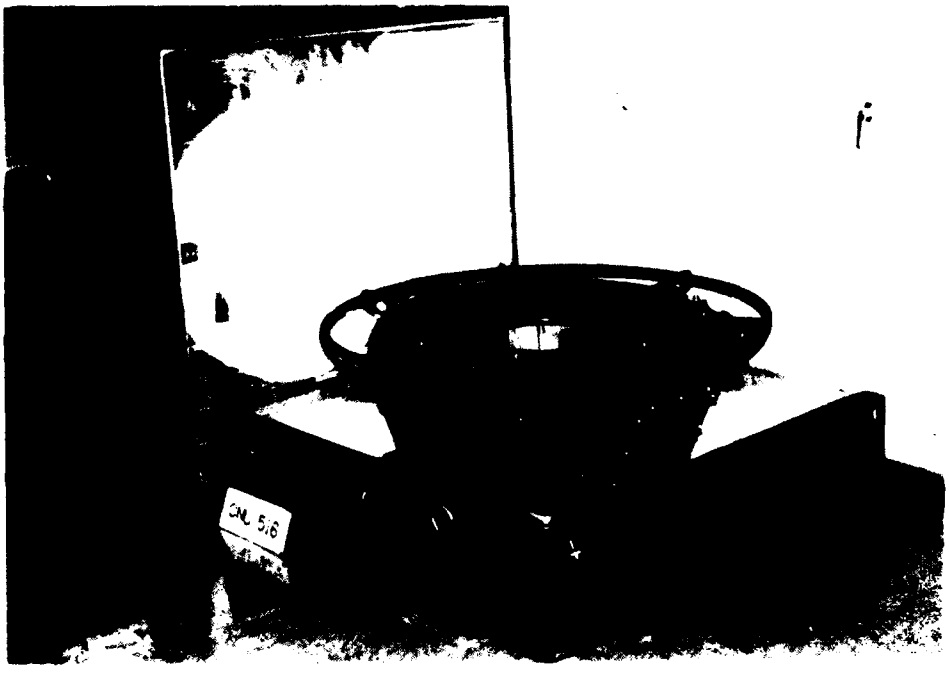


Figure 4. CNU-516/E Container, Open, Showing Base Assembly

Figure 5. CNU-518/E Container.

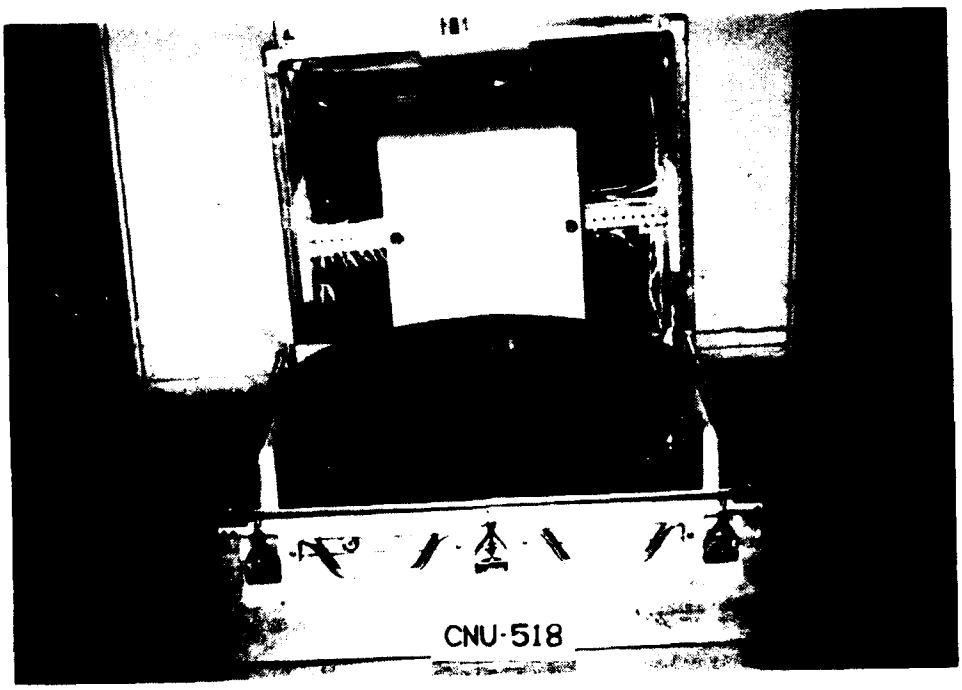


Figure 6. CNU-518/E Container, Open, Showing Waveguide Reel.

Figure 7. CNU-519/E Container.

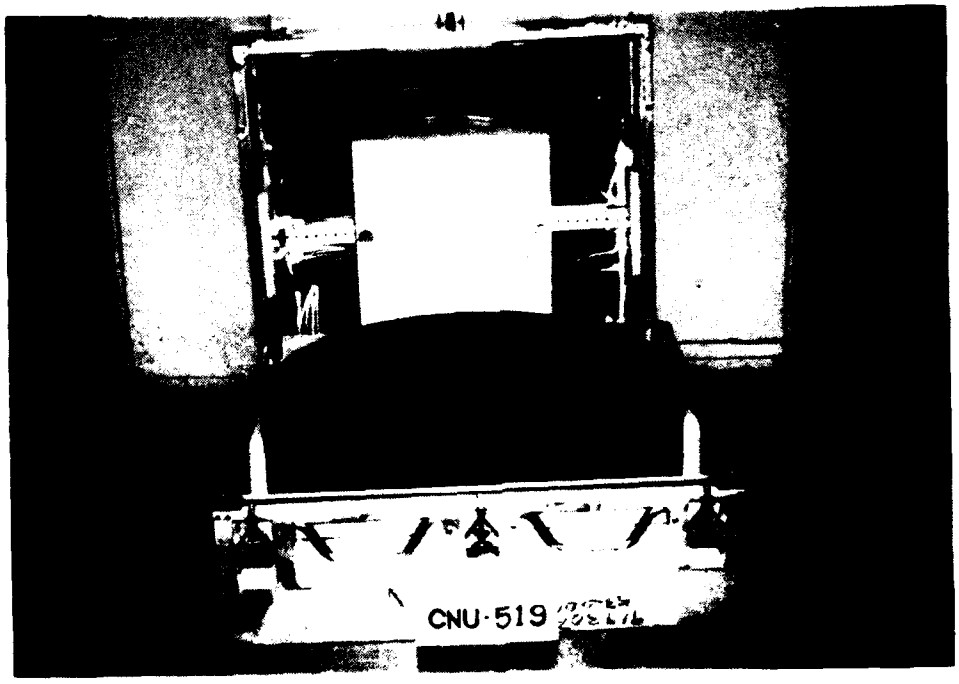


Figure 8. CNU-519/E Container, Open, Showing Cable Reel.

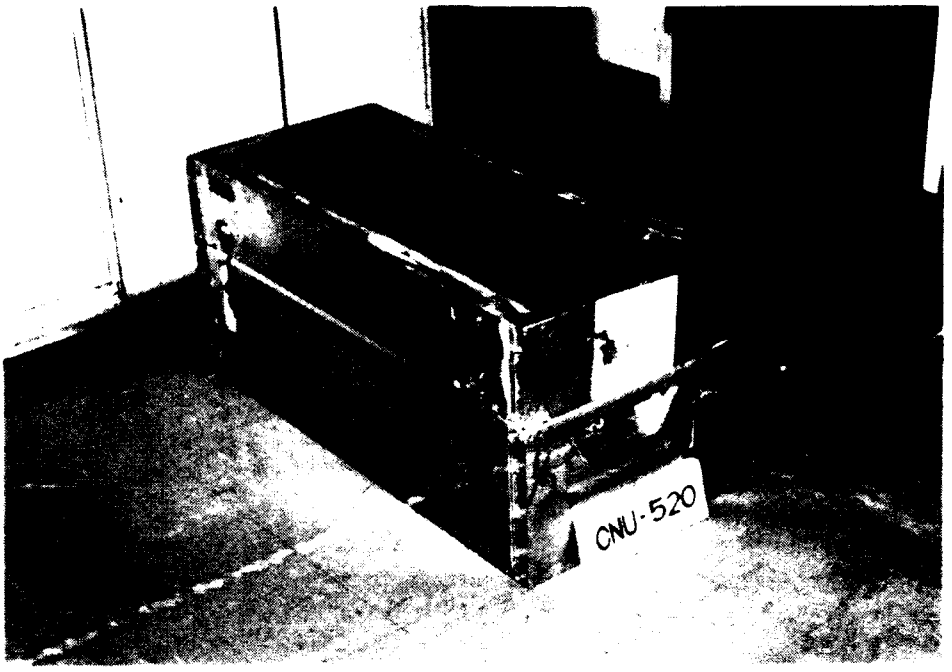


Figure 9. CNU-520 Container.

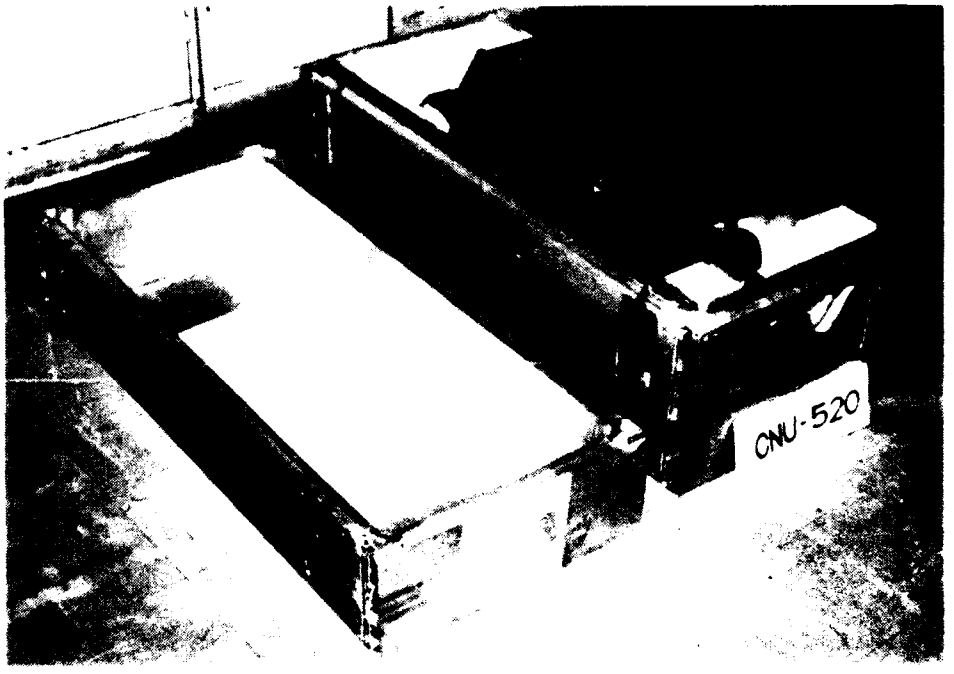
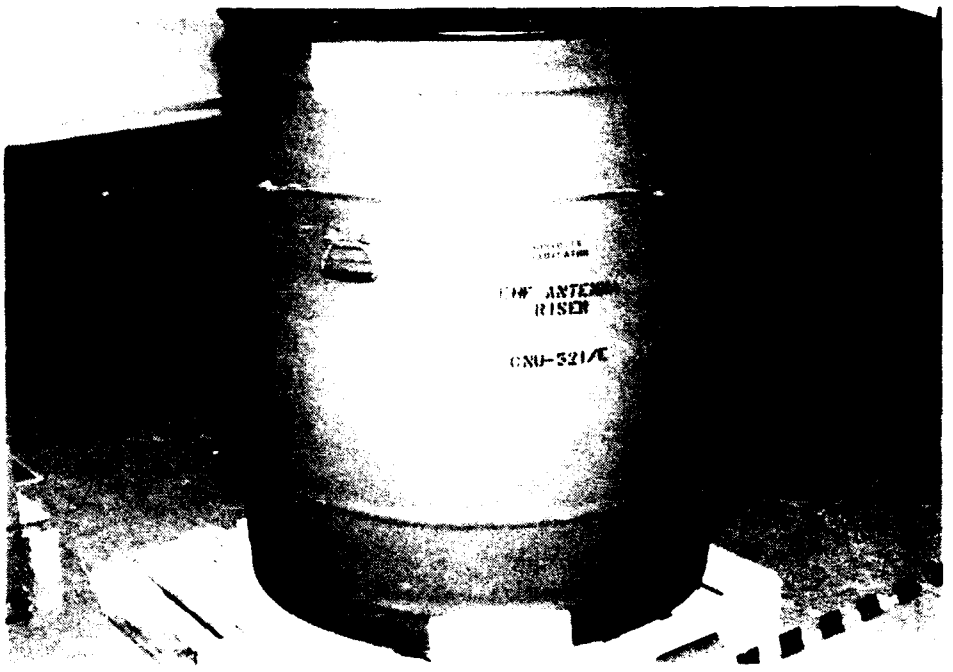
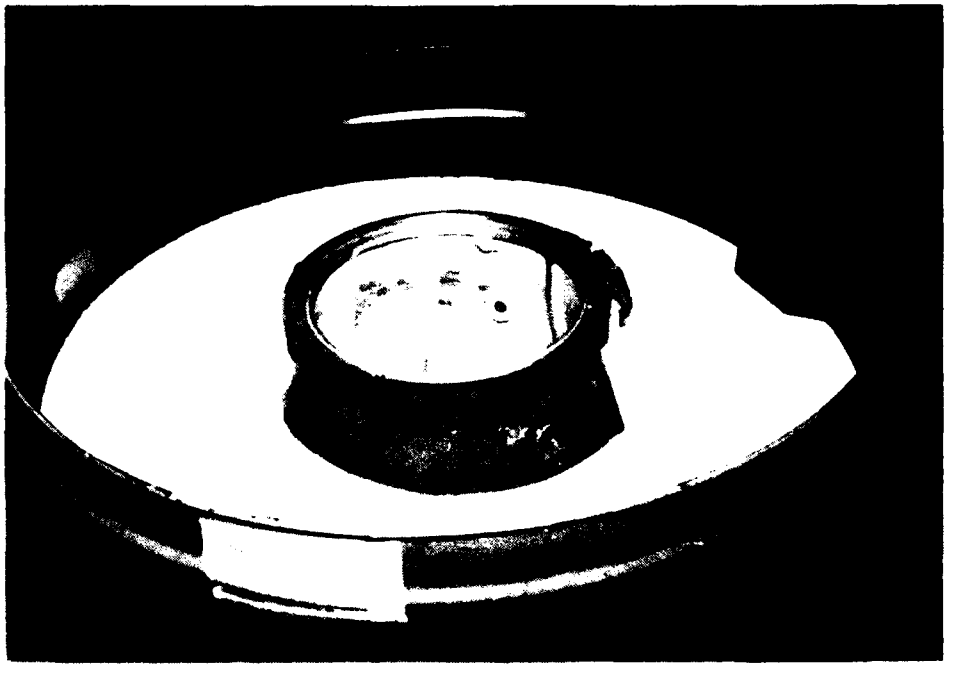


Figure 10. CNU-520 Container, Open, Showing UHF Antenna Drive.


RISER
CNU-521/E



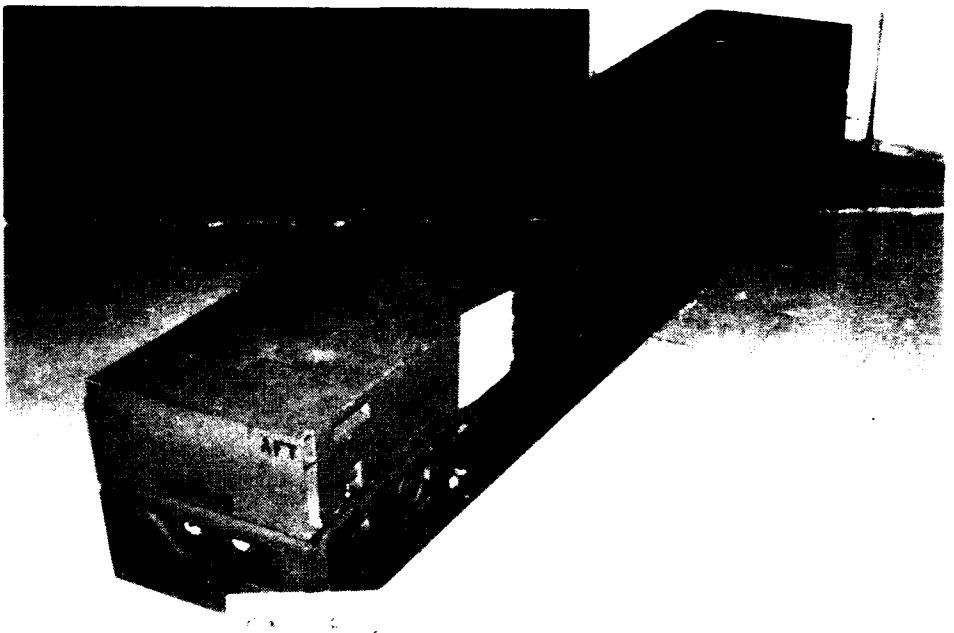


Figure [illegible] Container.

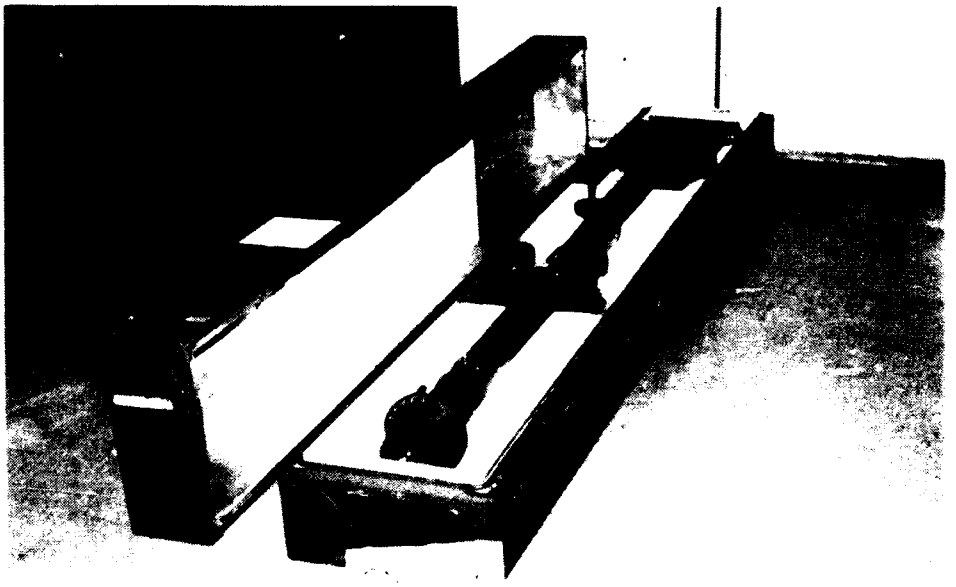


Figure [illegible] Container Open, Showing UHF Antenna Mast.

[illegible] Container.

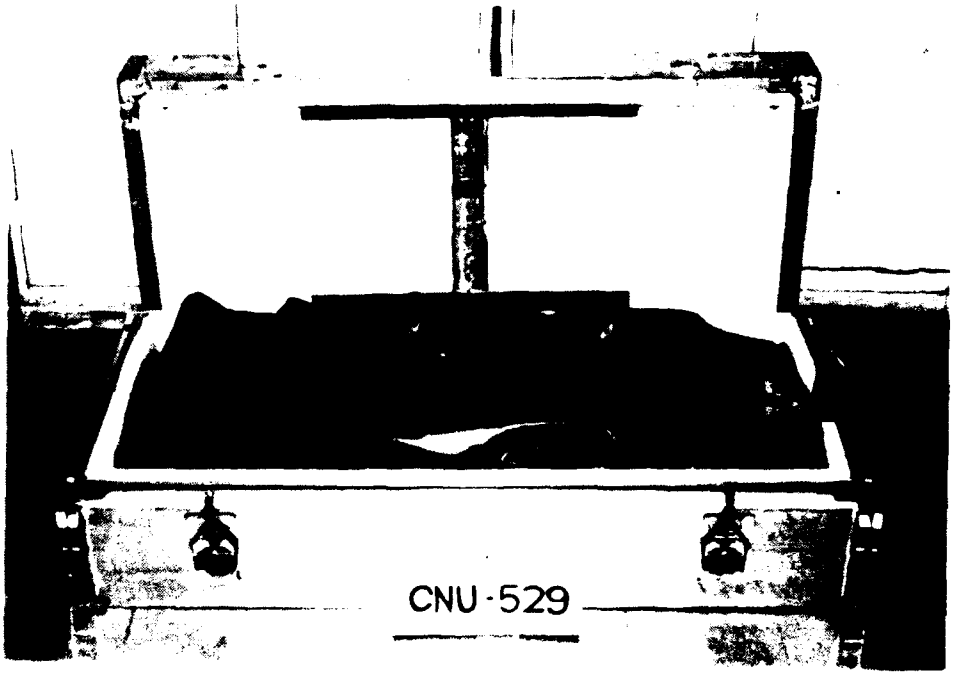


Figure [illegible]. CNU-529 Container, Open, Showing Ground Anchor and Grounding Rod Kit.

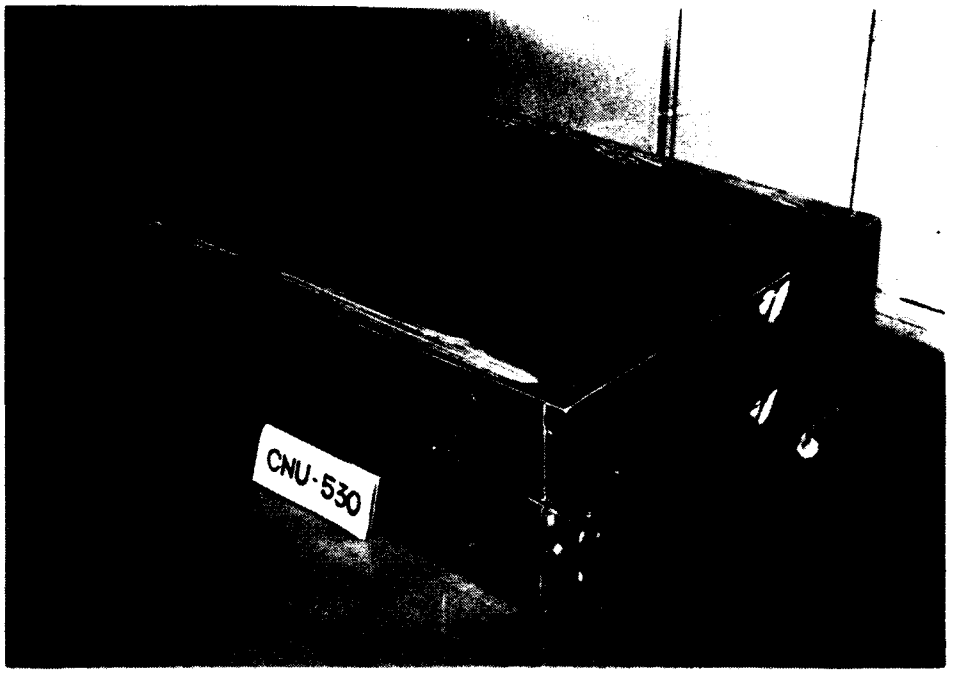


Figure 17. CNU-530/E Container.

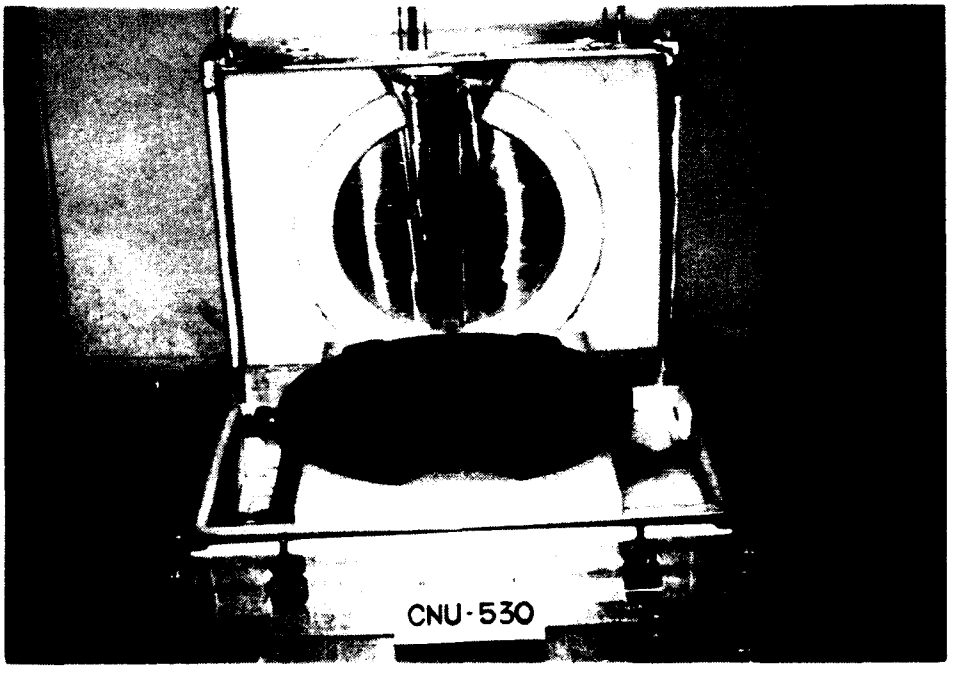


Figure 18. CNU-530 E Container, Open, Showing Base Assembly Baseplate, Outrigger Assembly, and Tensioning Tower Assembly.

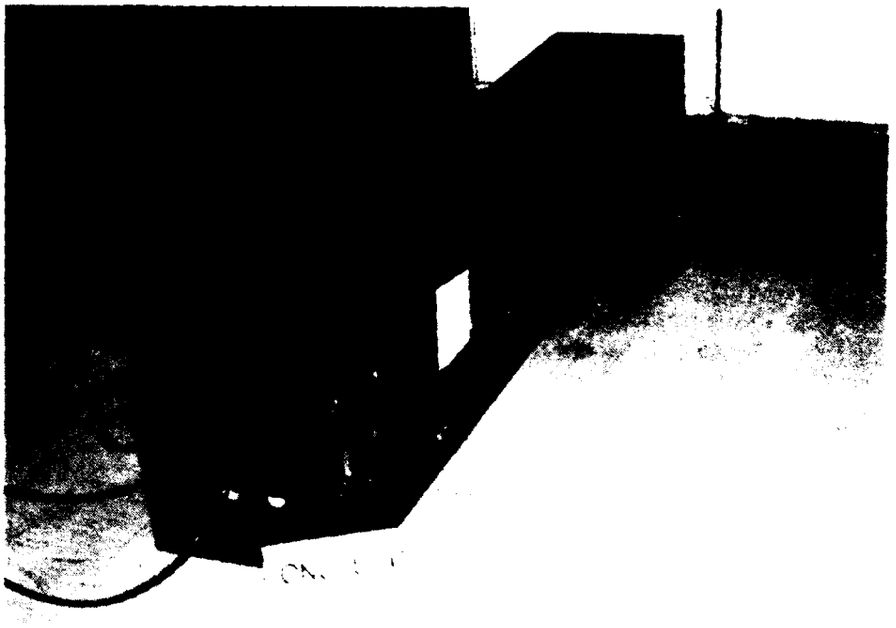


Figure 19. Leak Test, CNU-526 E Container.

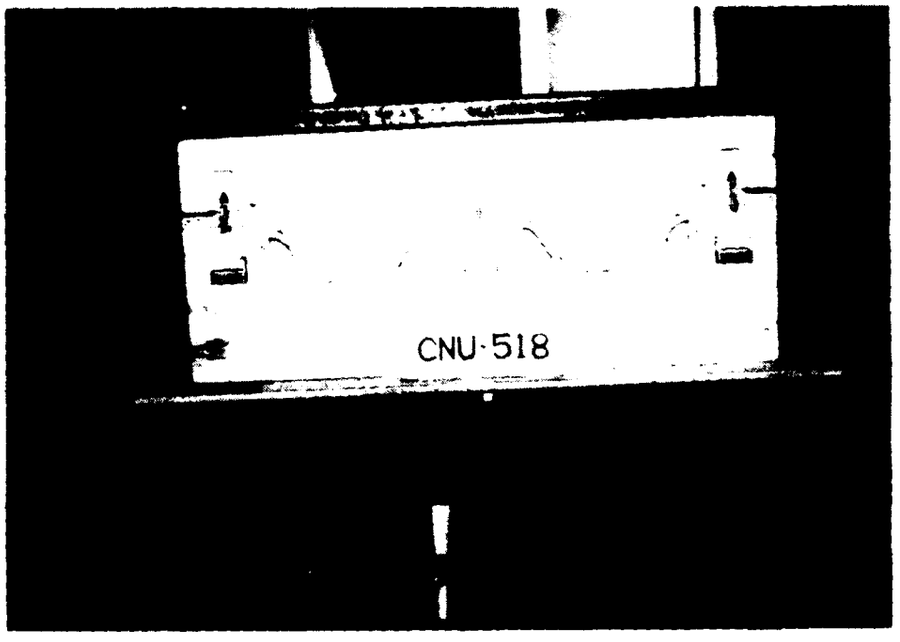


Figure 20. Vibration Test, CNU-518/E.

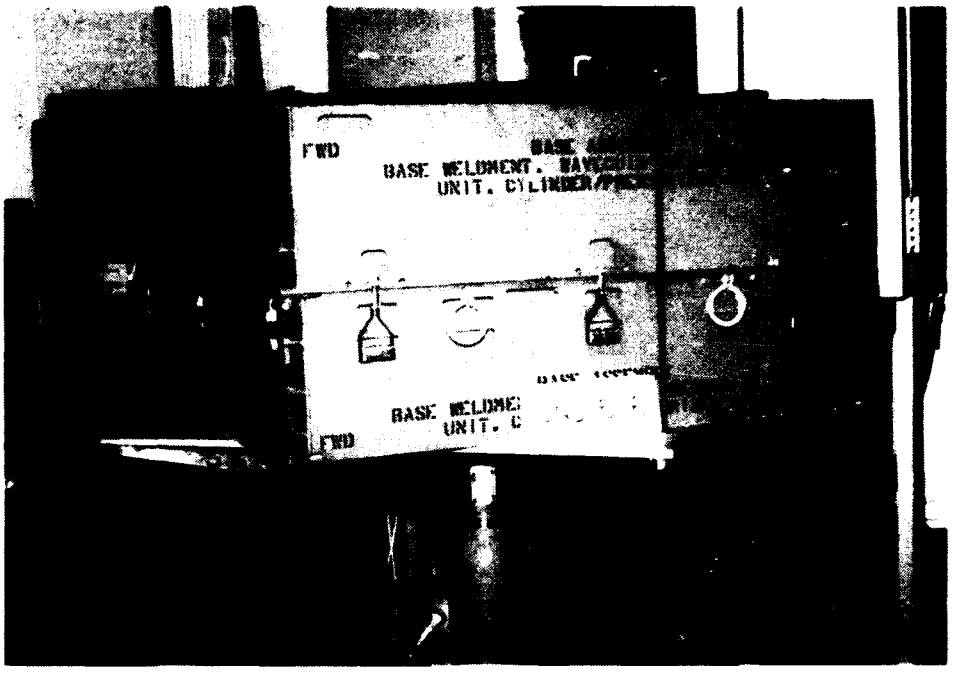


Figure 21. Vibration Test, CNU-516/E.

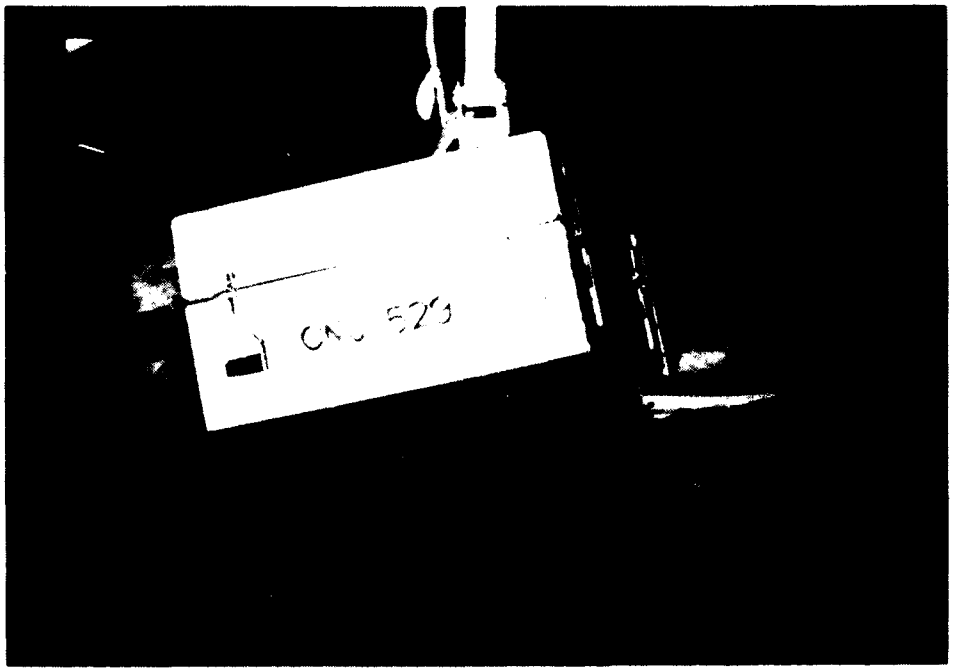
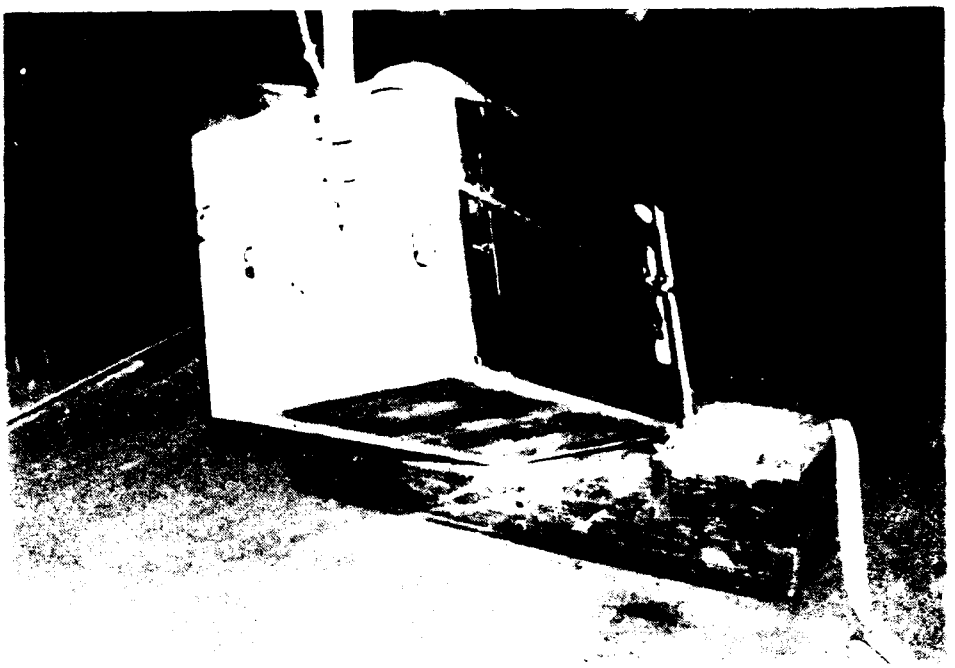
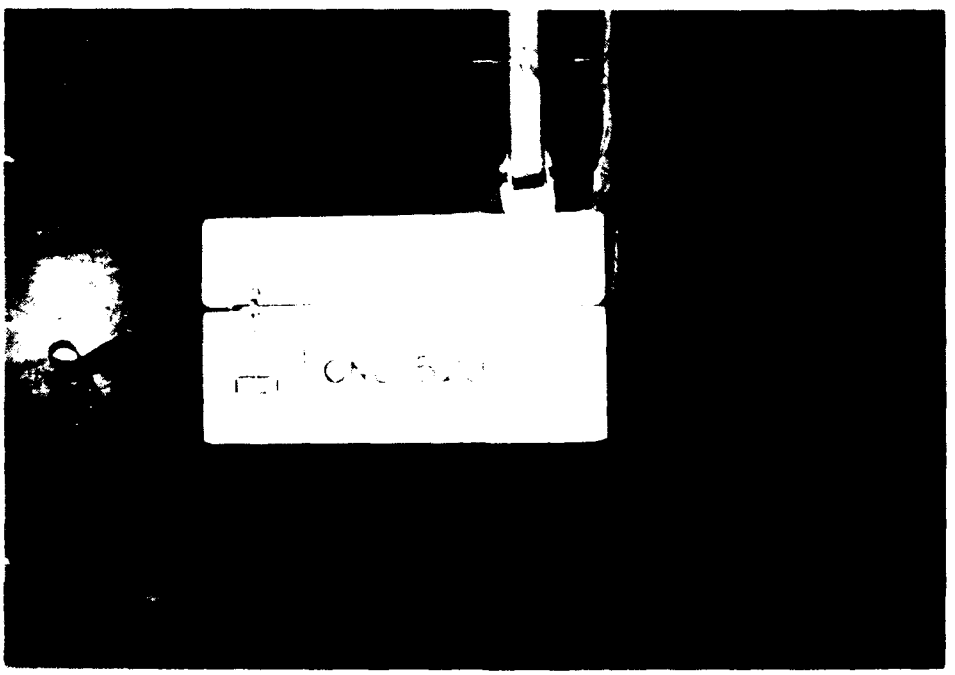
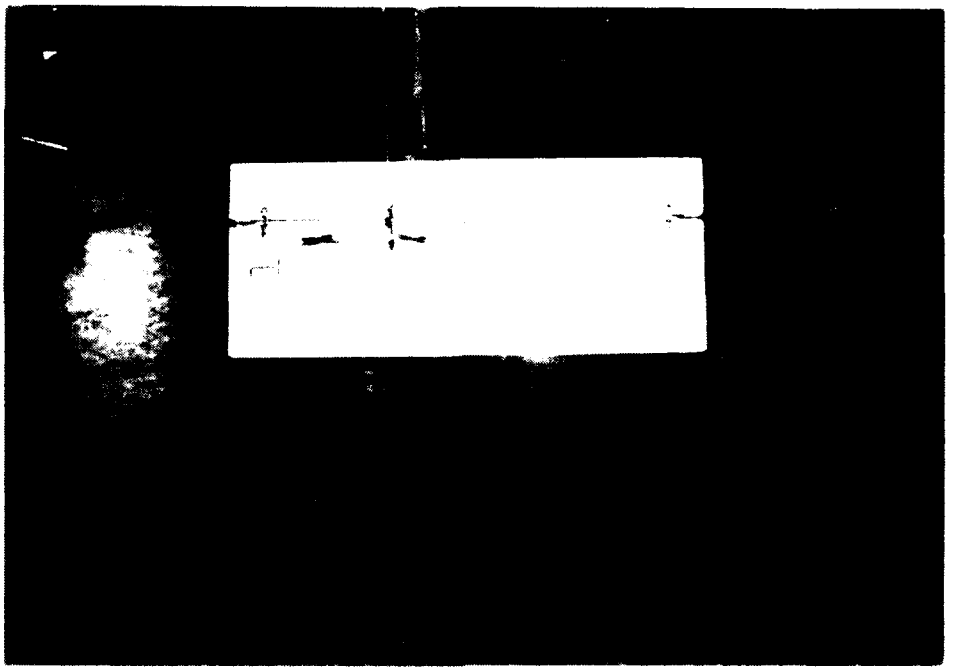
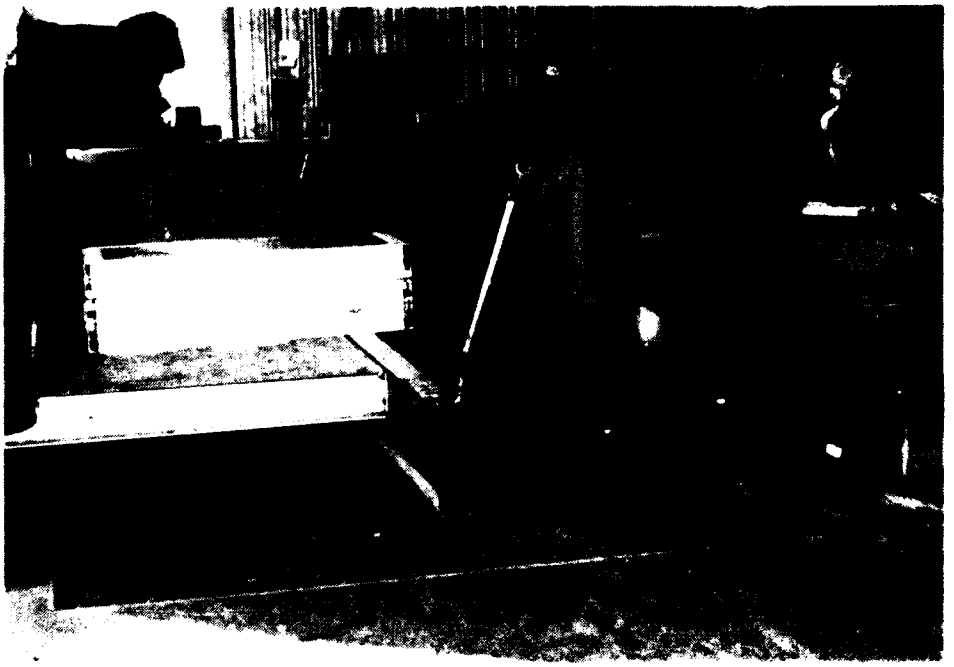


Figure 22. Cornerwise Drop Test, CNU-529/E









[illegible] Impact Test, [illegible]

[illegible] Location Impact Test, CNU-516 B Container, [illegible] Top Cushion Assembly.

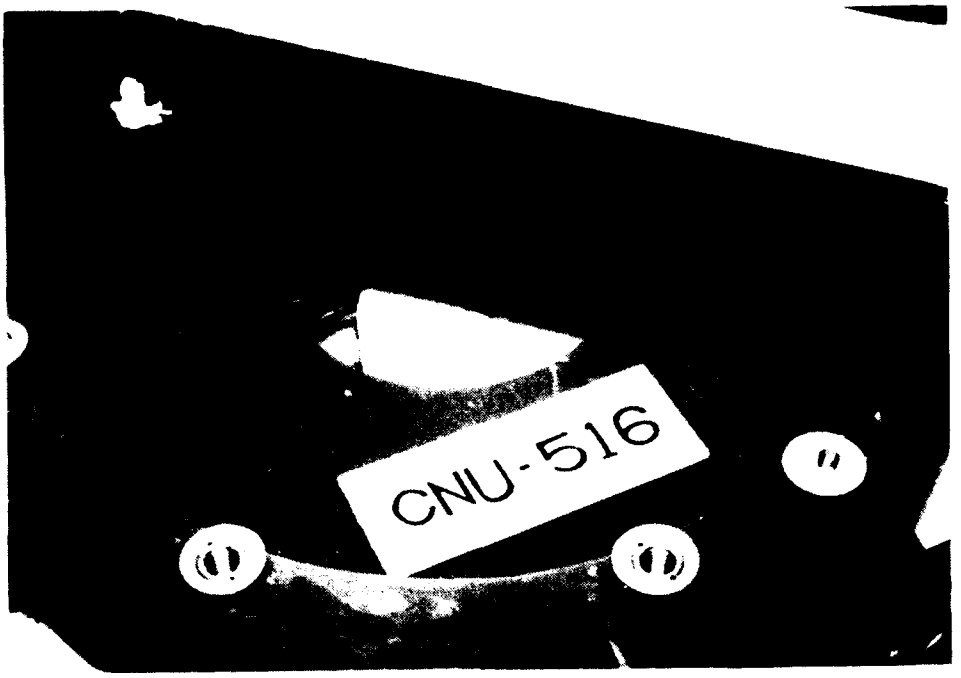


Figure 29. Pendulum Impact Test, CNU-516/E Container, Showing Cushion Pad Located inside Base Assembly Missing from Top Cushion Assembly.

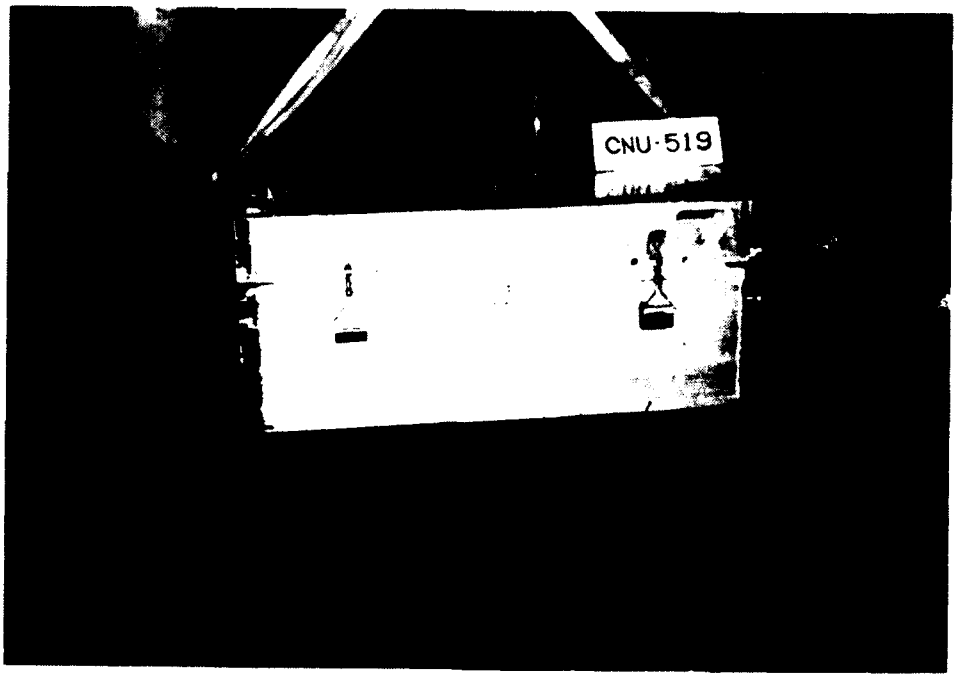
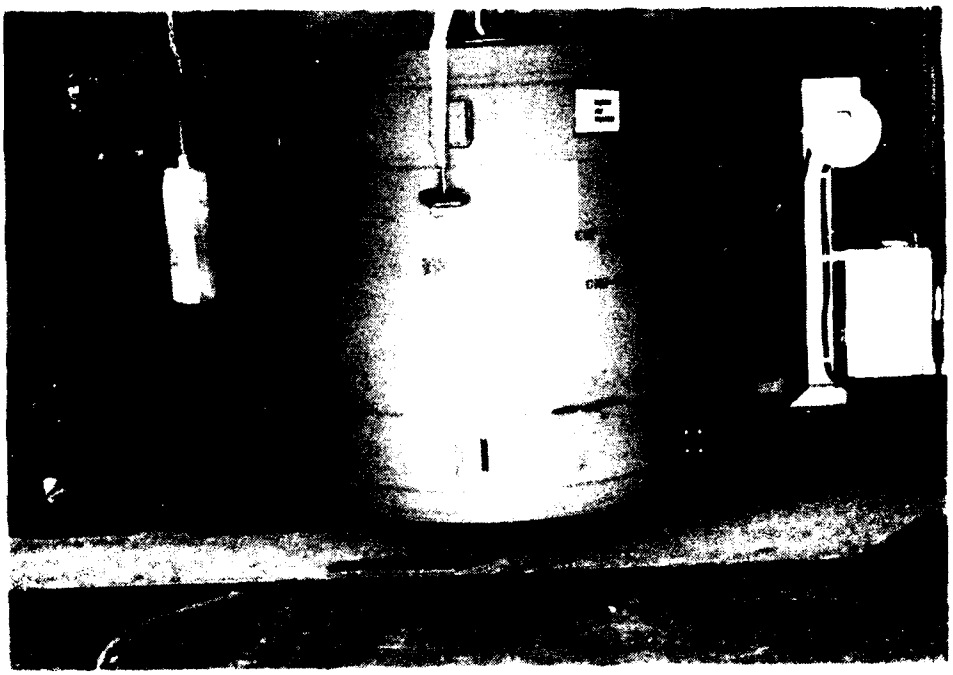
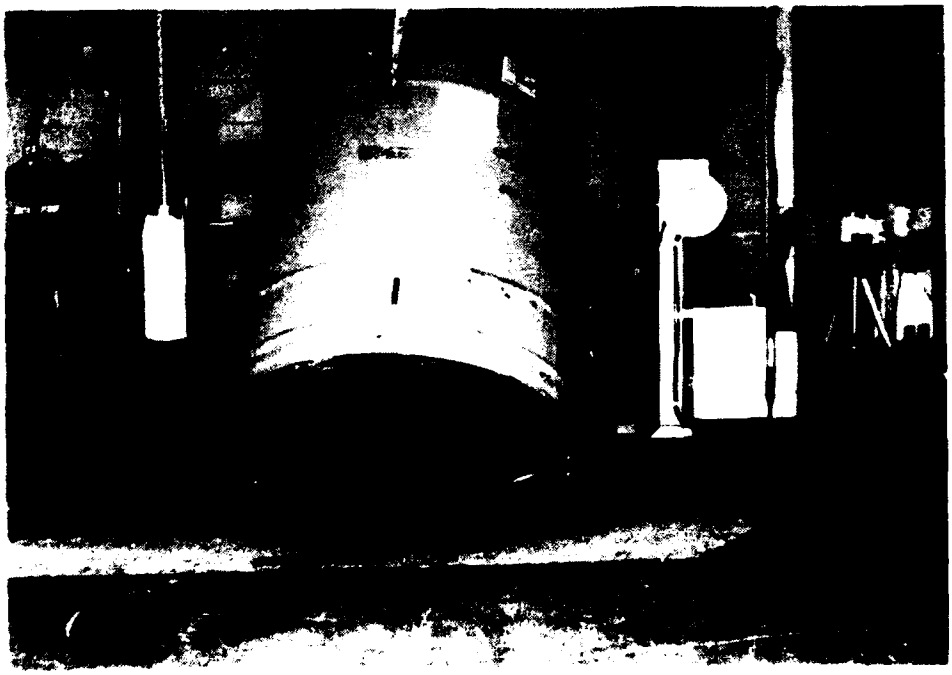


Figure 30. 24" Flat Bottom Drop, CNU-519/E Container.





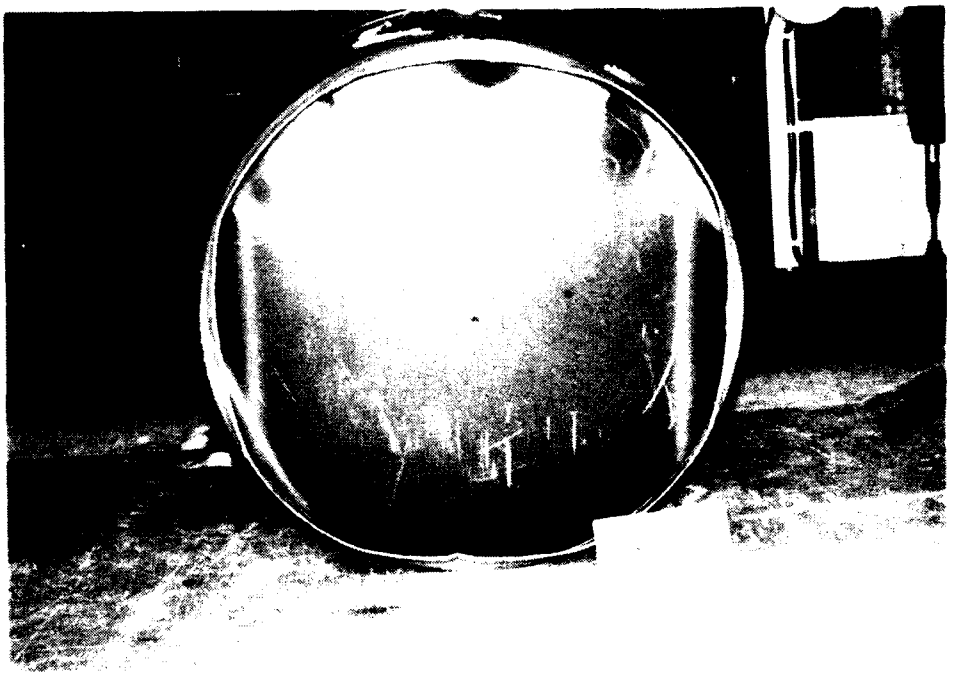


Figure [illegible]. 24" Edge Drop, CNU-521 E Drum, Edge Damage to Four Bottom Quadrants.

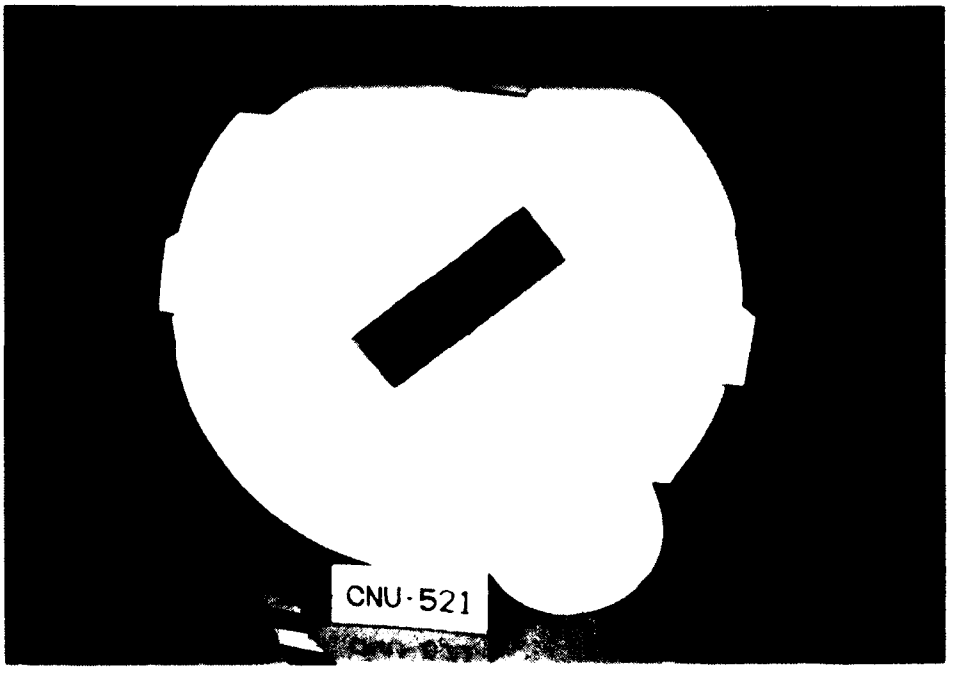


Figure [illegible]. 24" Edge Drop, CNU-521 E Drum, Damage to Top Cushion Assembly: Small Cylindrical Center Pad Sheared in Adhesive Layer from Large Pad.

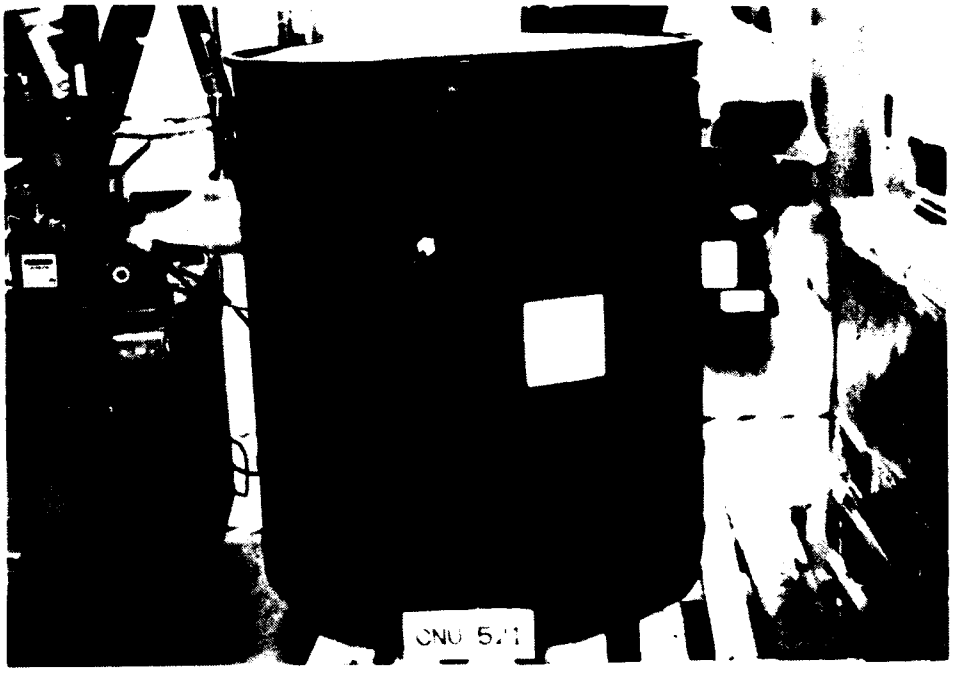


Figure 35. Leak Test #7, CNU-521/E Drum Container.

Figure 36. Leak Test #7, CNU-529/E Container, Rough Surface Finish Weld Grindings on Top Corner and Bottom Corner.

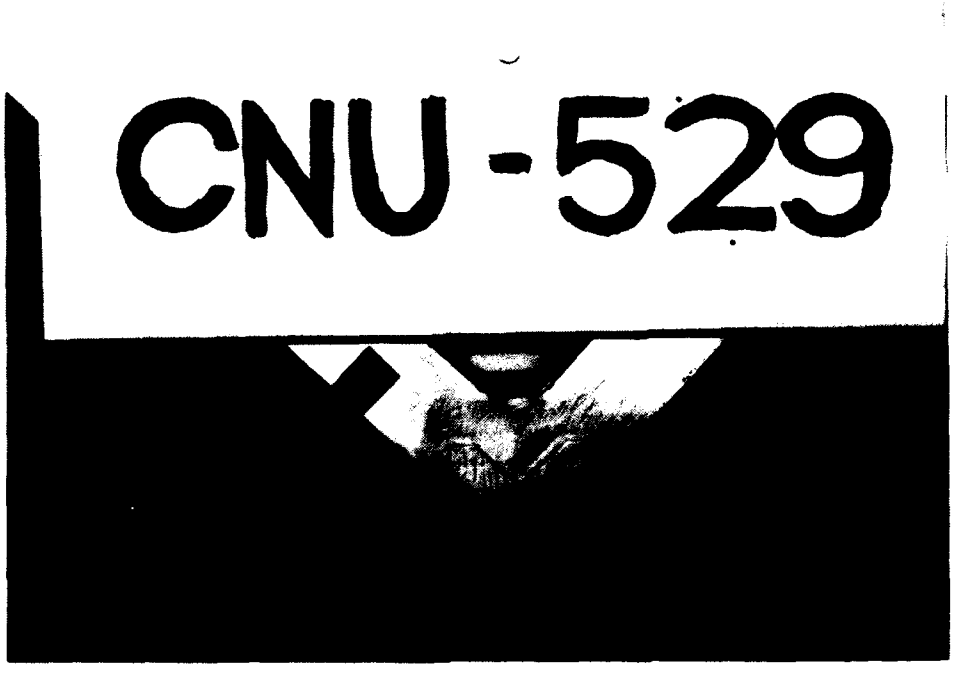


Figure 37. Leak Test #7, CNU-529/E Container, Rough Surface Finish Weld Grindings on Another Top Corner.

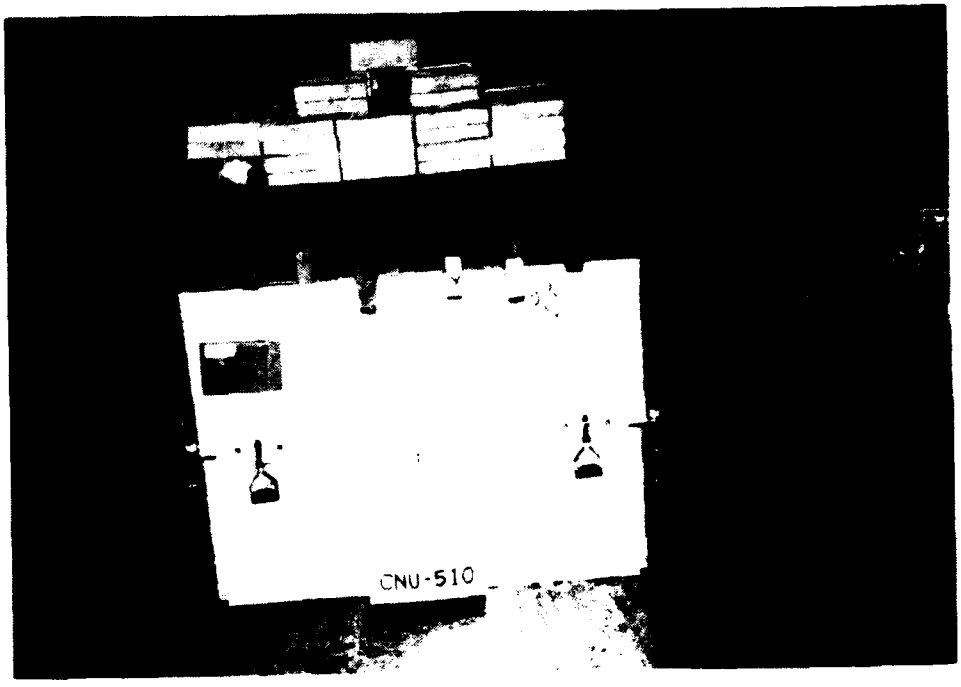


Figure 38. Superimposed Load Test, CNU-510/E Container.

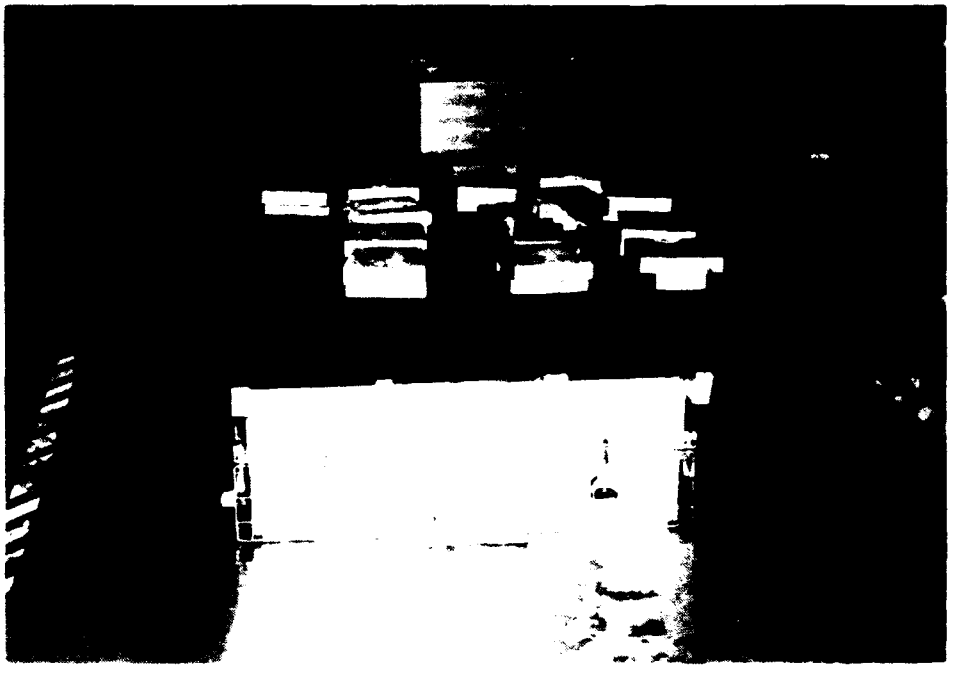


Figure [illegible]. Superimposed Load Test, CNU-530/E Container.

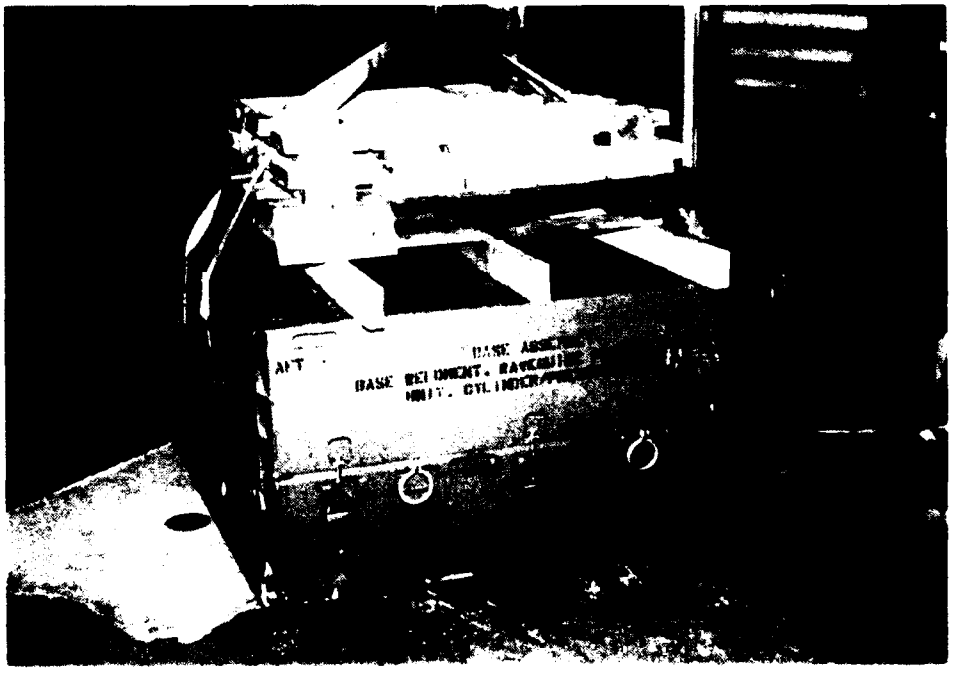
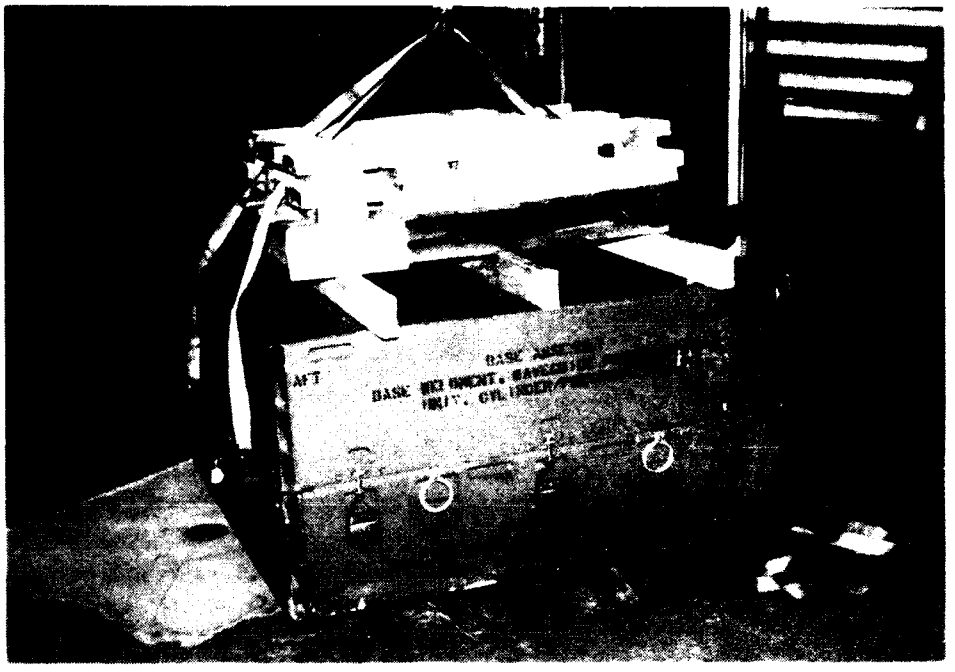
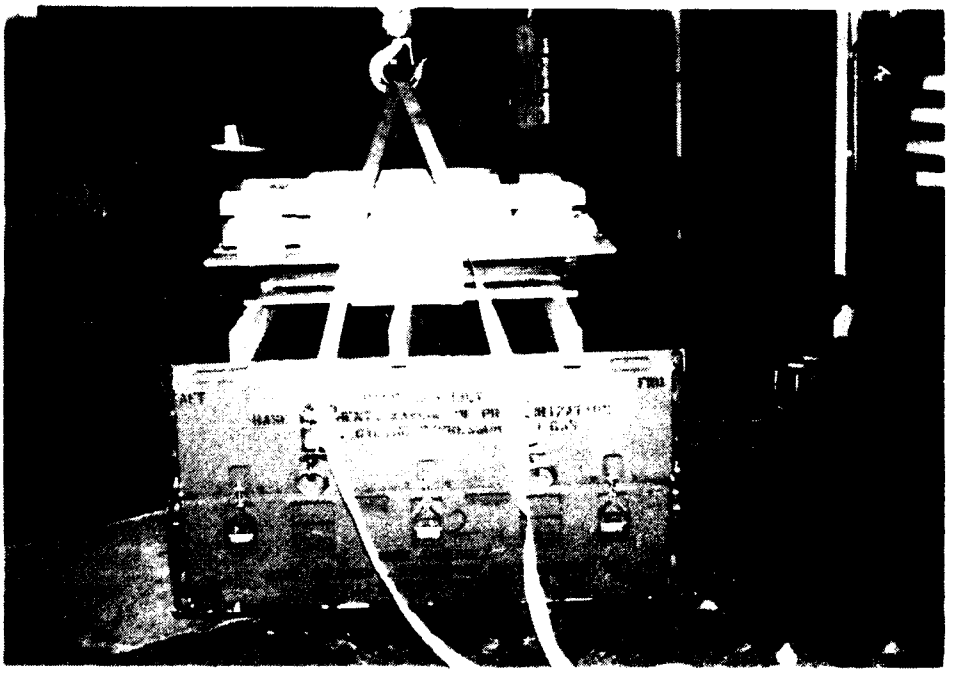
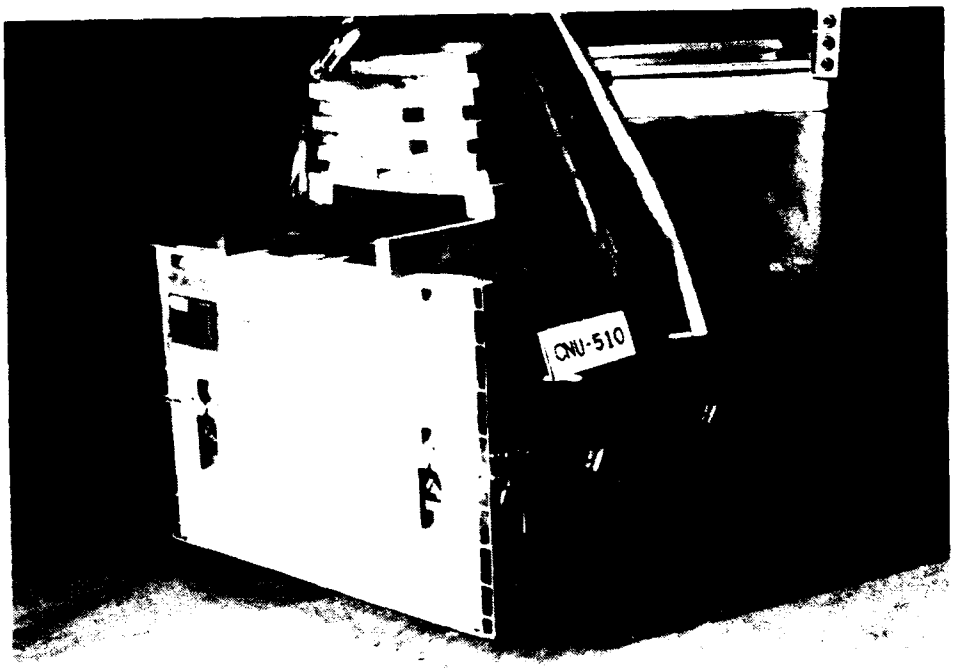
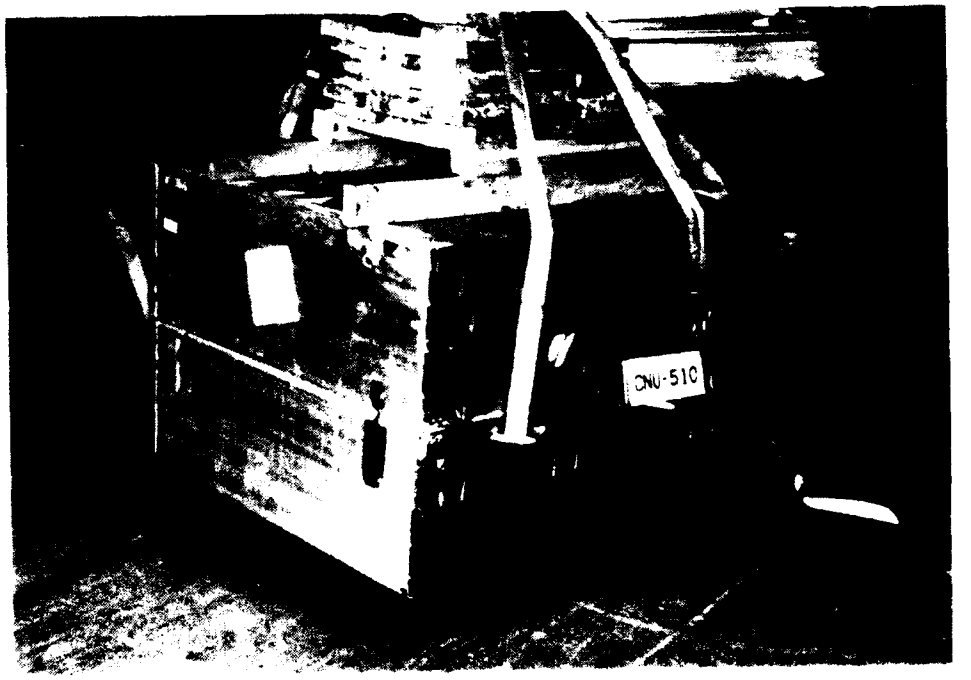


Figure 40. Hoisting Fittings Strength Test, CNU-530/E Container, Upper Handles.









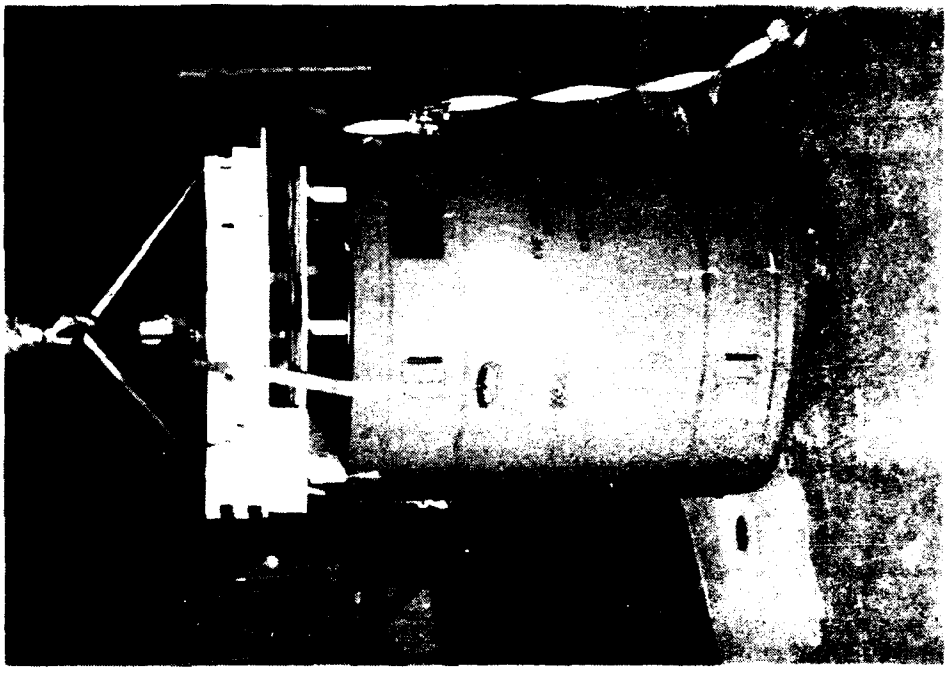


Figure
Vertical

Figure
Vertical

Figure 47. Hoisting Fitting Strength Test, CNU-521 E Drum, Vertical Carriage Handle Deformation.

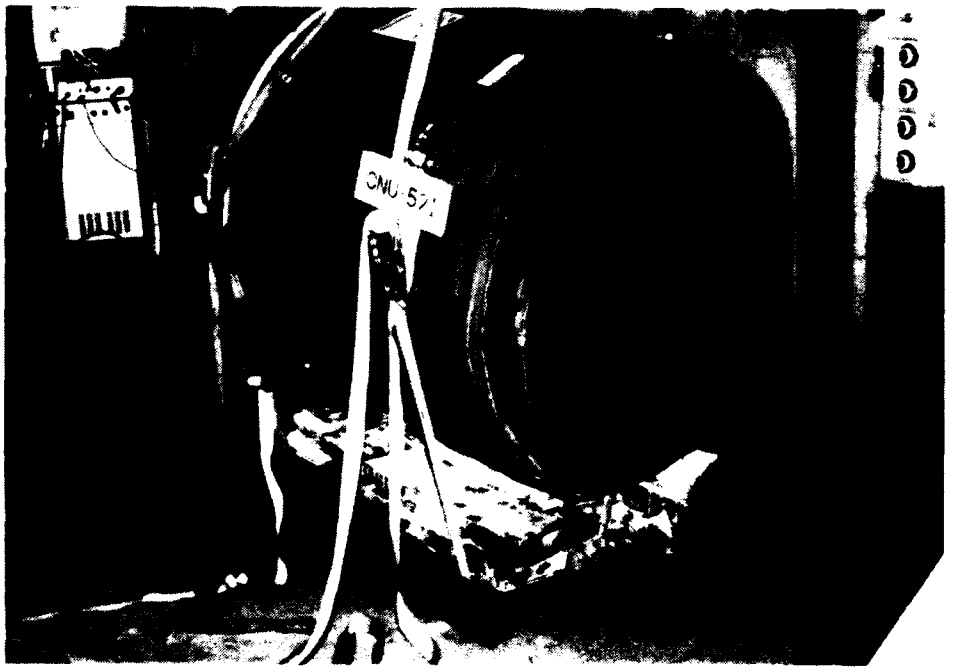


Figure 48. Hoisting Fitting Strength Test, CNU-521 E Drum, Horizontal Carriage Position.

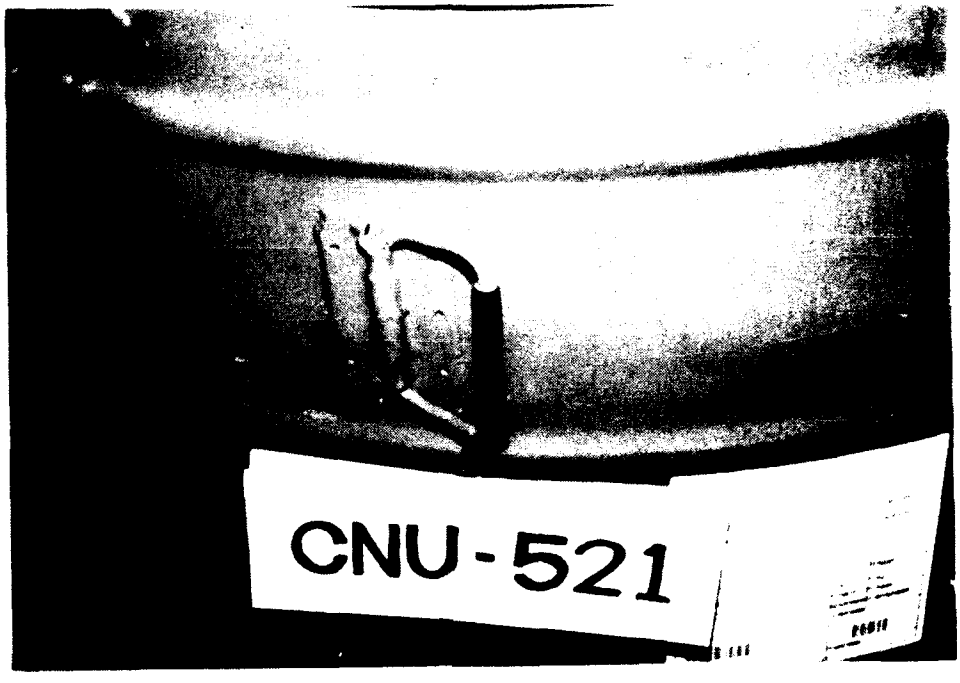


Figure 49. Hoisting Fitting Strength Test, CNU-521/E Drum, Horizontal Carriage Handle Deformation.

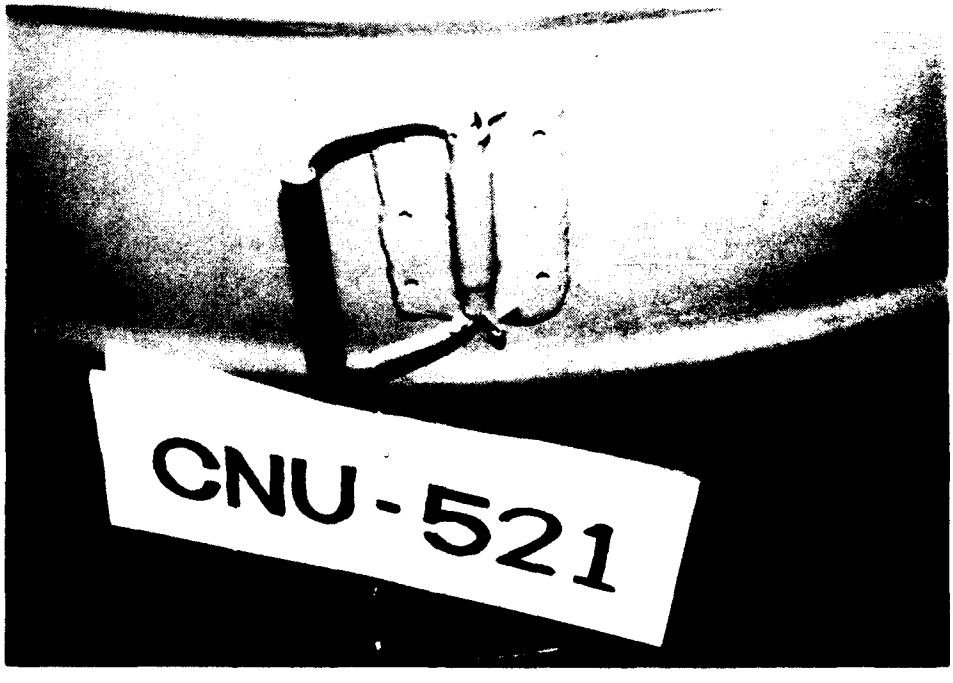


Figure 50. Hoisting Fitting Strength Test, CNU-521/E Drum, Horizontal Carriage Handle Deformation.

Figure 6.1. Hoisting Fitting Strength Test, CNU-521 F Drum, Horizontal Carriage Handle Deformation.

Figure 6.2. Hoisting Fitting Strength Test, CNU-521 F Drum, Horizontal Carriage Handle Deformation.

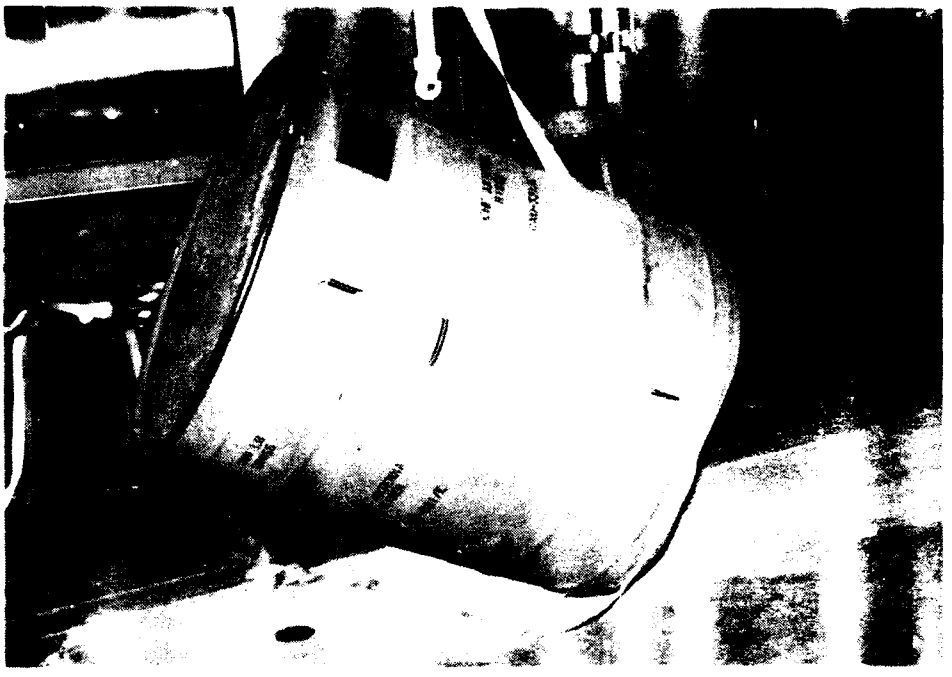


Figure [illegible]
Drum.

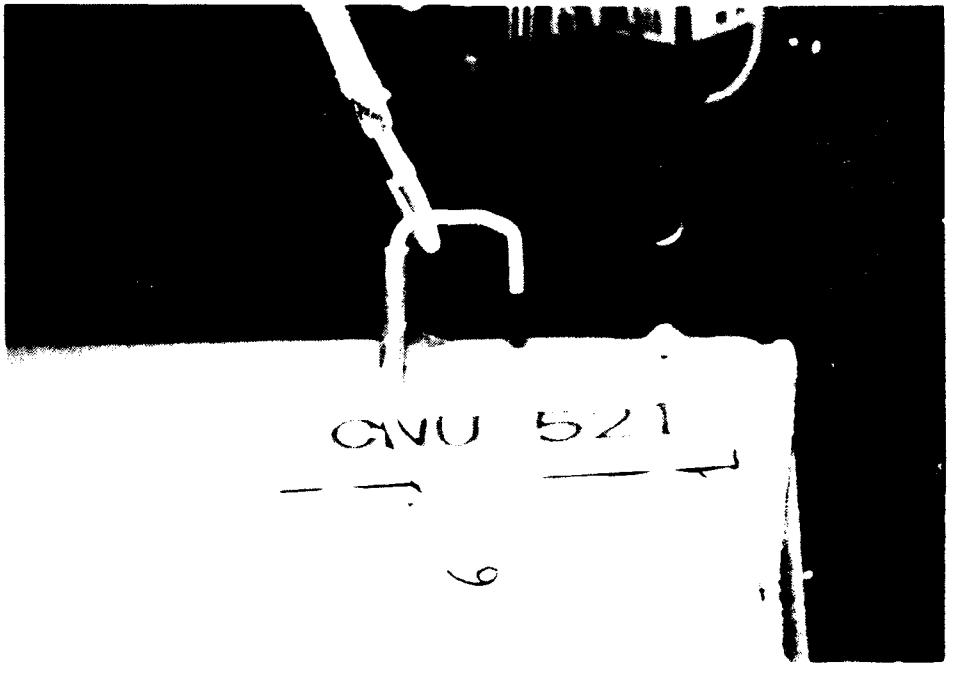
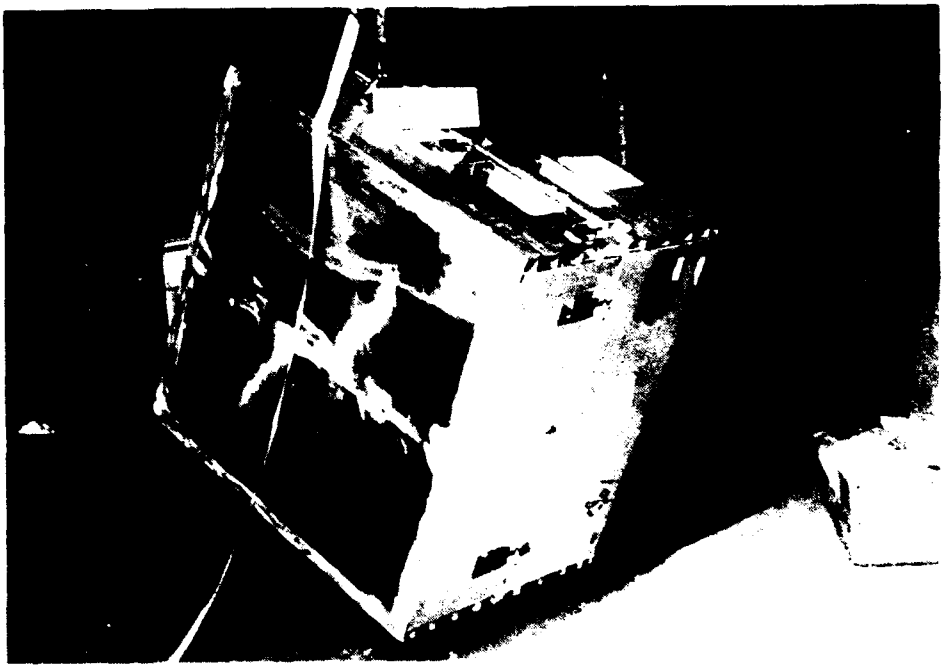


Figure [illegible]
Drum, Barrel [illegible]



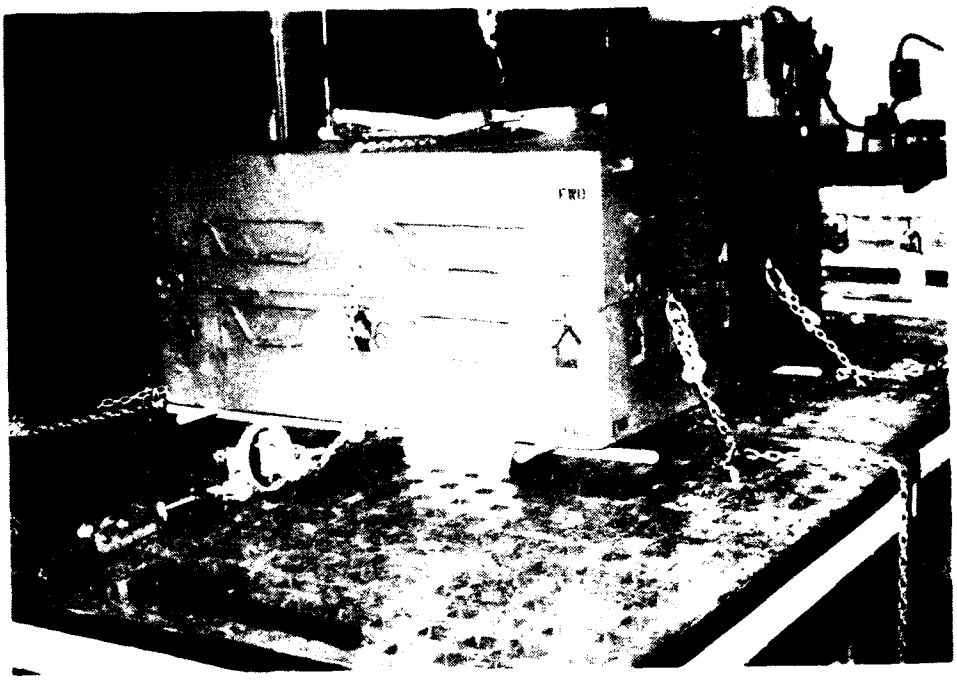


Figure [illegible]
Forward Restraint Loading of Pickup Bumper

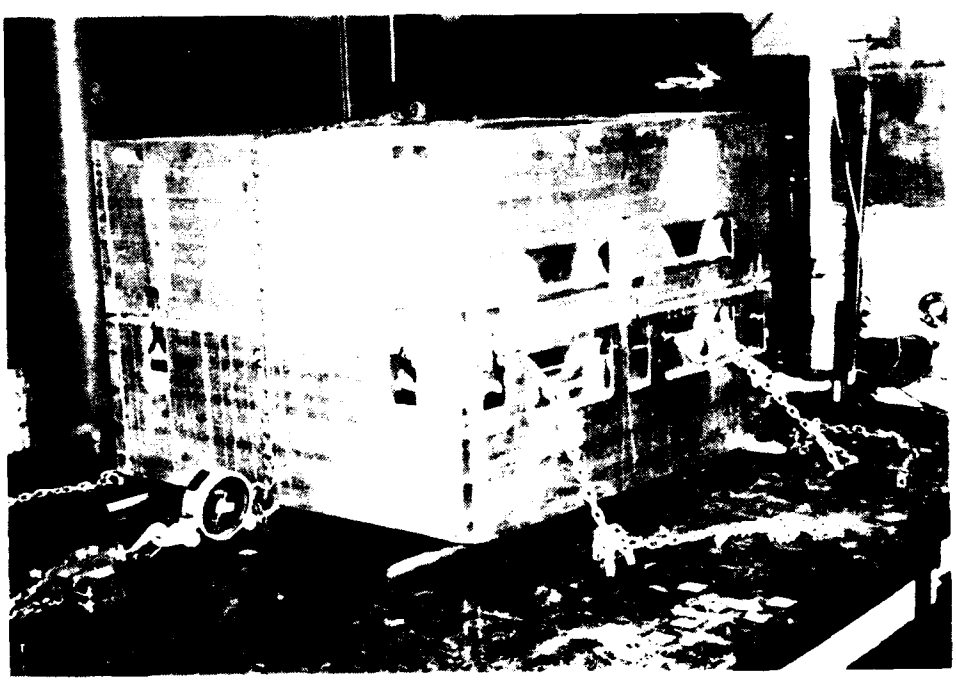


Figure 58. [illegible]
2 Constraint [illegible]
Failure by [illegible]

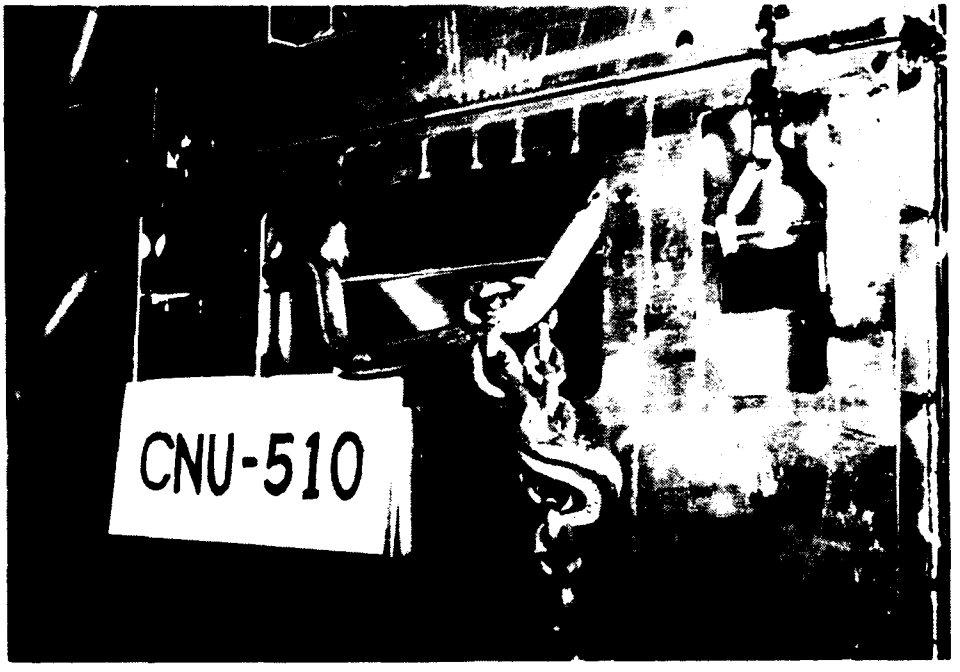


Figure 5-6. Tiedown Strength Test, CNU-510/E Container, Side 6 Constraint Loading, Lower Tiedown, Side 6, Corner 4-6 Failure of Tailing from Interior Socket and Deformation.

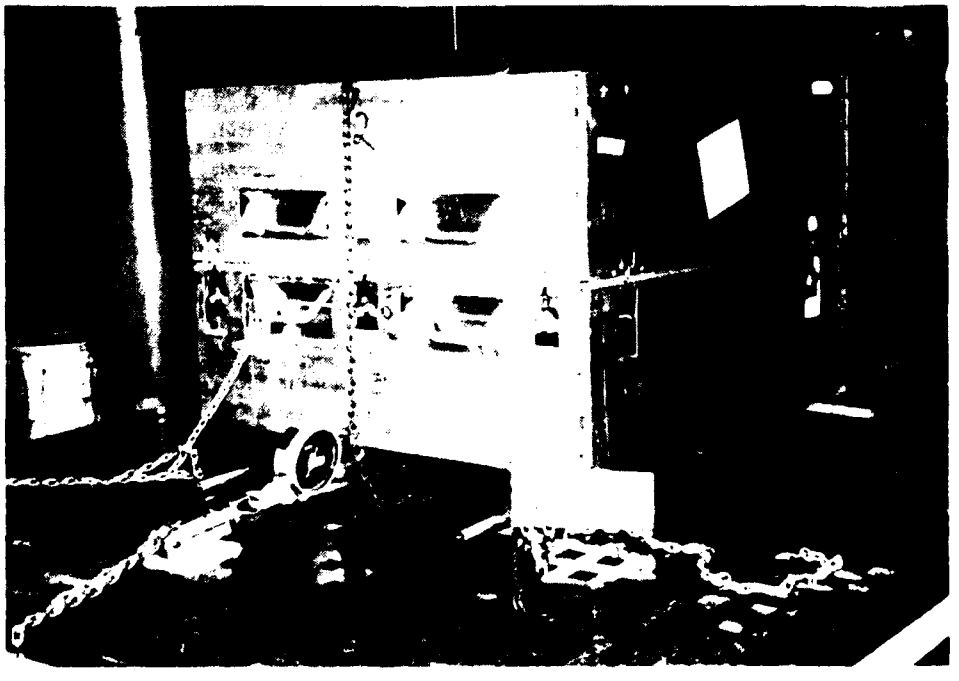


Figure 5-7. Tiedown Strength Test, CNU-510 Container, Side 6 Constraint Loading, Lower Tiedowns.

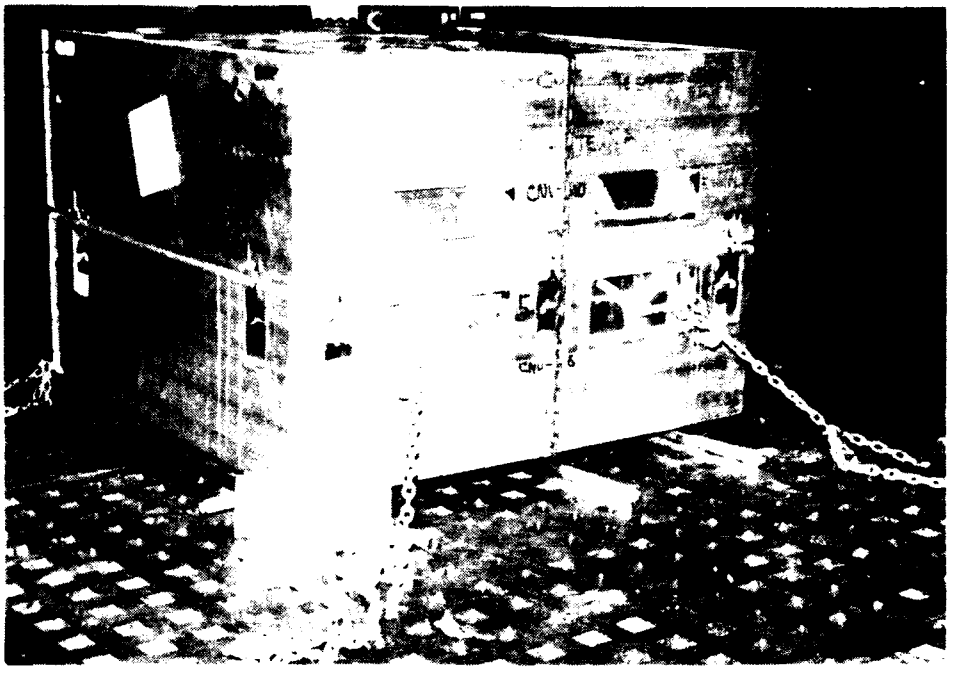


Figure 61. Tiedown Strength Test, CNU-510 Container, Constraint Loading, Lower Tiedown, Side 5, Forward End, Failure by Pulling from Interior Socket and Bottom of ...

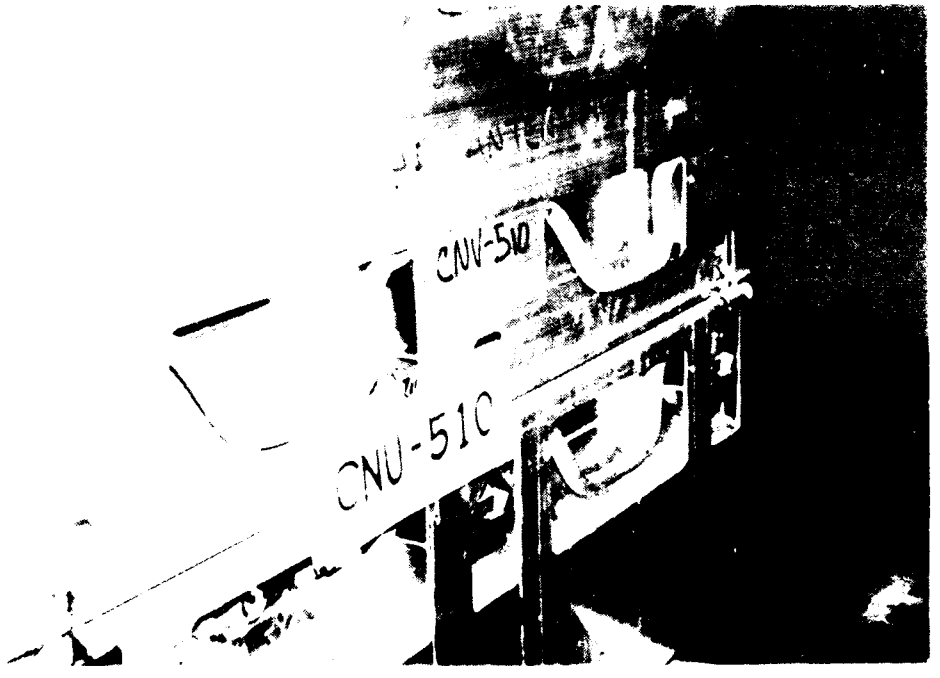


Figure 62. Tiedown Strength Test, CNU-510 ... Test Inspection, Tiedown Deformation, Side ... Upper Handles Will Not Retract into Recess ... Replaced into Sockets.

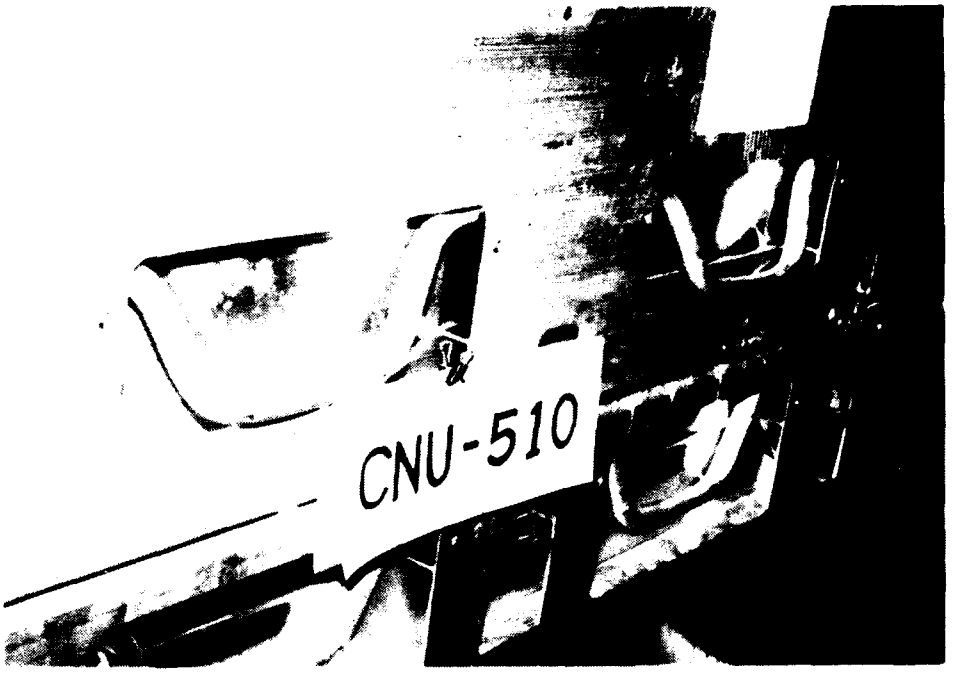


Figure 63. Tiedown Strength Test, CNU-510/E Container, Post Test Inspection, Tiedown Deformation, Side 6. Note that Upper Handles Will Not Retract into Recesses after Being Replaced into Sockets.

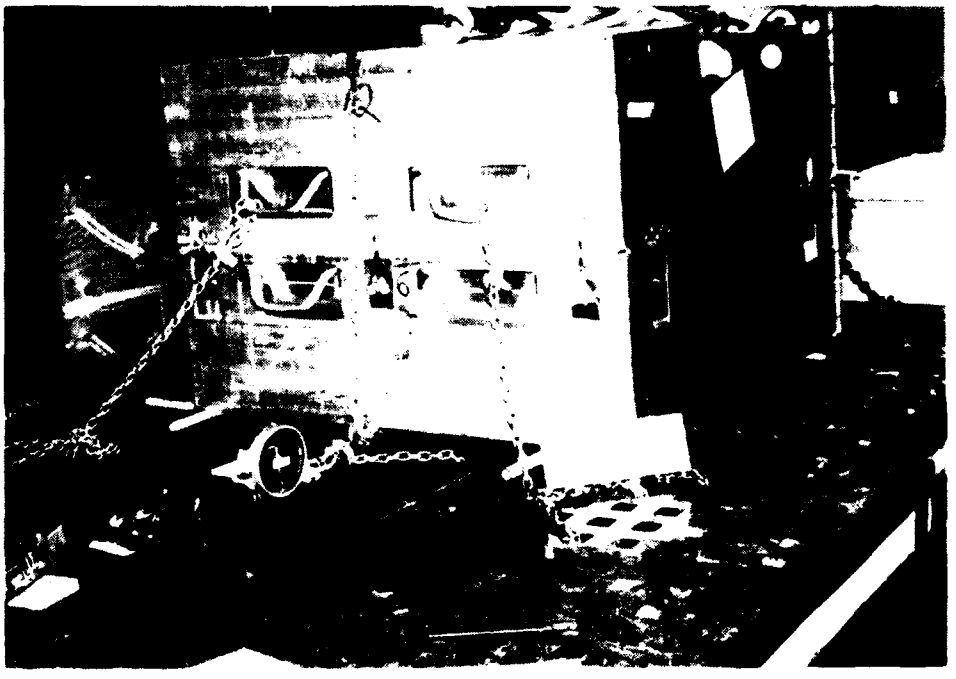


Figure 64. Tiedown Strength Test, CNU-510M/E Container, Side 6 Constraint Loading, Upper Tiedowns.

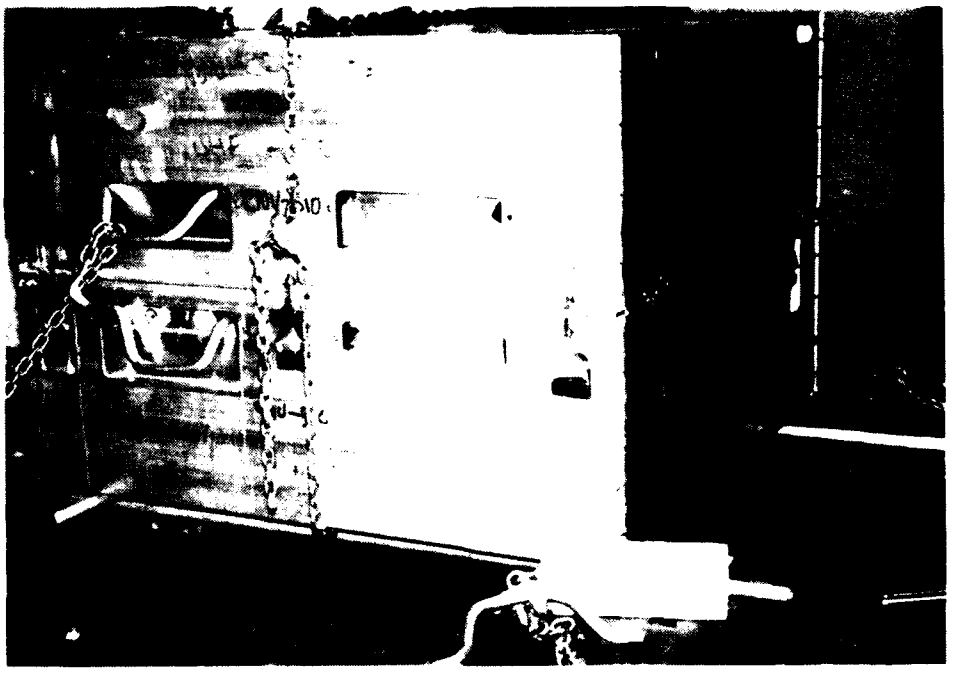


Figure 65. Tiedown Strength Test, CNU-510M/B Container, Side 6 Constraint Loading, Upper Tiedown, Side 5, Corner 2-5 Failure by Pulling from Both Sockets and Deformat[illegible].

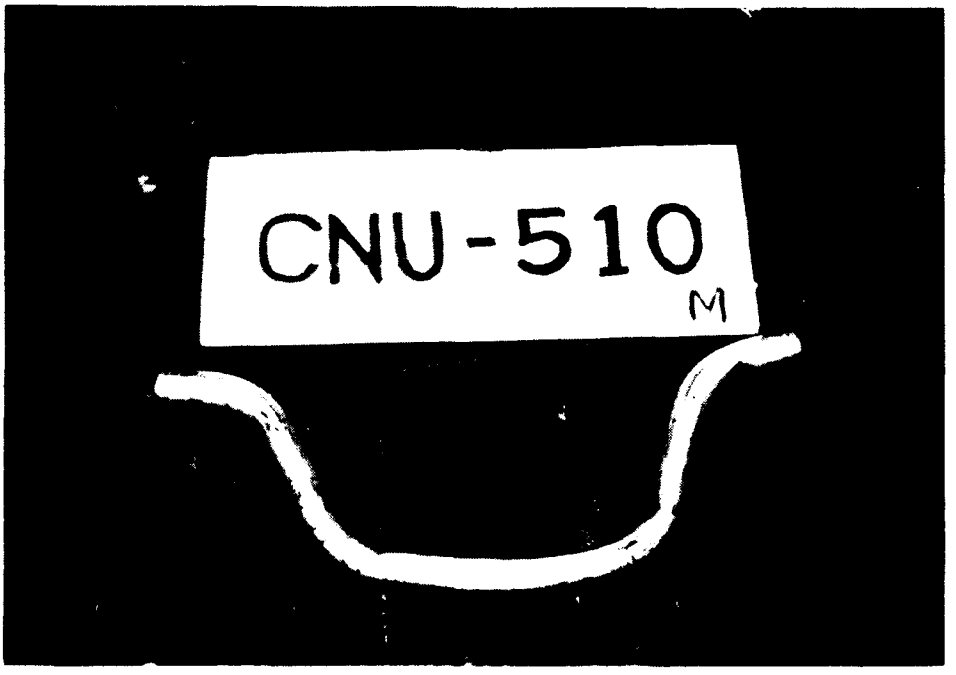


Figure 66. Tiedown Strength Test, CNU-510M B Container, Side 6 Constraint Loading, Upper Tiedown, Side [illegible] Corner [illegible] Failure. Note Handle Permanent Deformation.

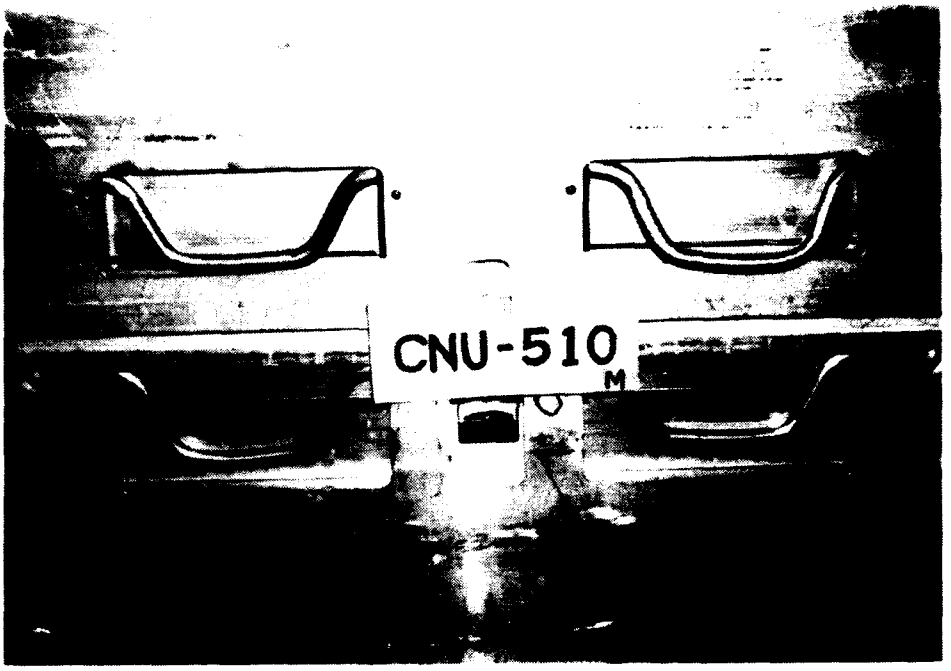


Figure 67. Tiedown Strength Test, CNU-510M/E Container, Post Test Inspection, Tiedown Deformation, Side-6. Note that Left Upper Handle Will Not Retract into Recess after Being Replaced into Sockets.

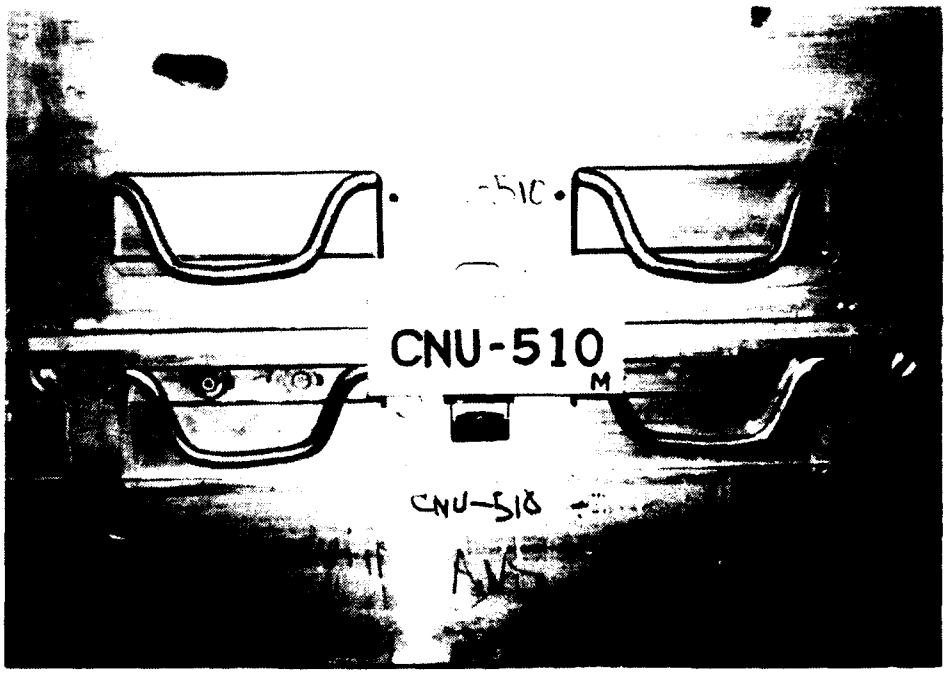


Figure 68. Tiedown Strength Test, CNU-510M/E Container, Post Test Inspection, Tiedown Deformation, Side 5. Note that Upper Handles Will Not Retract into Recesses after Being Replaced into Sockets.

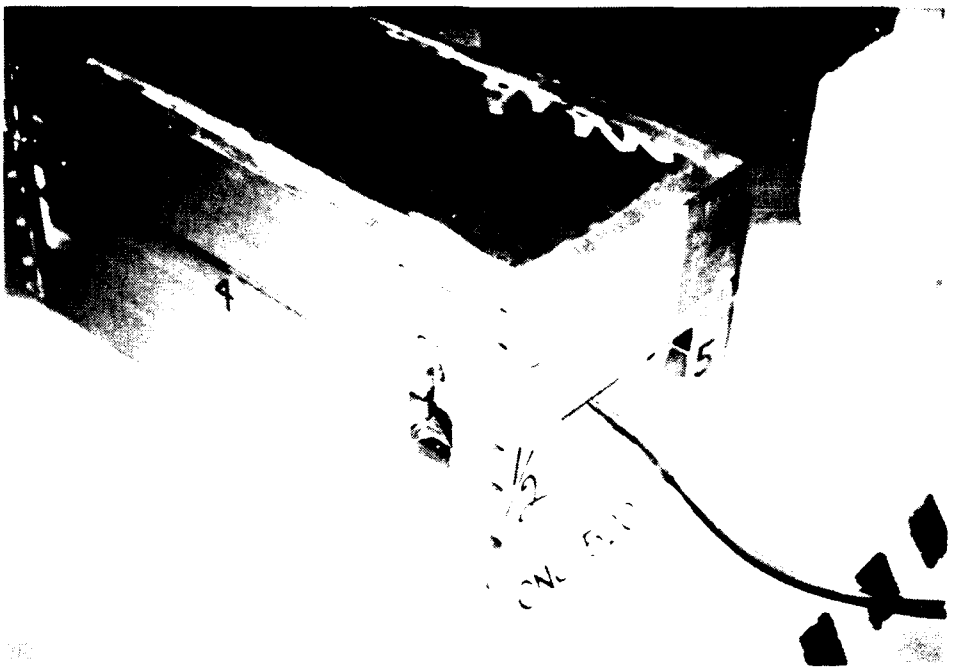


Figure 69. Structural Integrity Test, CNL-[illegible] F Container.

APPENDIX 3

TEST DATA

Test 2, MIL-STD-648A, 5.3.2, Resonance Strength and Dwell Test, Ambient Temperature.

Container	Swept 5-50 Hz Time (min)	Resonant Frequency (Hz)	Resonant Dwell Time (min)	Damage Incurred
CNU-510	7.5	12.0	30	None
CNU-516	7.5	12.3	30	None
CNU-518	7.5	11.8	30	None
CNU-519	7.5	12.4	30	None
CNU-520	7.5	12.4	30	None
CNU-521	7.5	12.0	30	None
CNU-526				No Test
CNU-529	7.5	12.4	30	None
CNU-530	7.5	12.2	30	None

Test 8, Fed-Std-101C, Method 5016.1, Superimposed Load Test (Stackability with Dunnage), Level A.

Container: CNU-510
Superimposed Load: 2370 pounds
Damage Incurred: None

Dimension Location	Dimension Orientation	Initially Unloaded (Inches)	Loaded One Hour (Inches)	Unloaded Post Test (Inches)
Side 2	Horizontal	45	45	45
Side 6	Horizontal	45	45	45
Side 4	Horizontal	45	45	45
Side 5	Horizontal	45	45	45
Corner 2-5	Vertical	31 1/2	31 1/2	31 1/2
Corner 2-6	Vertical	31 7/16	31 1/2	31 1/2
Corner 4-6	Vertical	31 1/2	31 1/2	31 1/2
Corner 4-5	Vertical	31 1/2	31 1/2	31 1/2
Diagonal Side 2	Top 2-5 to Bottom 2-6	54 5/8	54 5/8	54 5/8
Diagonal Side 5	Top 2-5 to Bottom 4-5	54 3/4	54 3/4	54 3/4
Diagonal Side 4	Top 4-6 to Bottom 4-5	54 5/8	54 5/8	54 5/8
Diagonal Side 6	Top 4-6 to Bottom 2-6	54 3/4	54 3/4	54 3/4

Container: CNU-516
Superimposed Load: 3800 pounds
Damage Incurred: None

Dimension Location	Dimension Orientation	Initially Unloaded (Inches)	Loaded One Hour (Inches)	Unloaded Post Test (Inches)
Side 2	Horizontal	50	50	50
Side 6	Horizontal	50	50	50
Side 4	Horizontal	50	50	50
Side 5	Horizontal	50	50	50
Corner 2-5	Vertical	25 1/16	25 1/16	25 1/16
Corner 2-6	Vertical	25	25	25
Corner 4-6	Vertical	25	25	25
Corner 4-5	Vertical	25	25	25 1/16
Diagonal Side 2	Top 2-5 to Bottom 2-6	55 5/8	55 5/8	55 5/8
Diagonal Side 5	Top 2-5 to Bottom 4-5	55 13/16	55 3/4	55 13/16
Diagonal Side 4	Top 4-6 to Bottom 4-5	55 3/4	55 5/8	55 3/4
Diagonal Side 6	Top 4-6 to Bottom 2-6	55 7/8	55 7/8	55 7/8

Container: CNU-518
Superimposed Load: 3732 pounds
Damage Incurred: None

Dimension Location	Dimension Orientation	Initially Unloaded (Inches)	Loaded One Hour (Inches)	Unloaded Post Test (Inches)
Side 2	Horizontal	41	41	41
Side 6	Horizontal	41	41	41
Side 4	Horizontal	41	41	41
Side 5	Horizontal	41	41	41
Corner 2-5	Vertical	17	16 15/16	16 15/16
Corner 2-6	Vertical	17 1/16	17	16 15/16
Corner 4-6	Vertical	17	16 15/16	16 15/16
Corner 4-5	Vertical	17	16 15/16	16 15/16
Diagonal Side 2	Top 2-5 to Bottom 2-6	44 1/8	44 1/8	44 1/8
Diagonal Side 5	Top 2-5 to Bottom 4-5	44 1/4	44 1/4	44 1/4
Diagonal Side 4	Top 4-6 to Bottom 4-5	44 1/8	44 1/8	44 1/8
Diagonal Side 6	Top 4-6 to Bottom 2-6	44 1/4 18.2	44 1/4	44 3/16

Container: CNU-519
Superimposed Load: 3732 pounds
Damage Incurred: None

Dimension Location	Dimension Orientation	Initially Unloaded (Inches)	Loaded One Hour (Inches)	Unloaded Post Test (Inches)
Side 2	Horizontal	41	41	41
Side 6	Horizontal	41	41	41
Side 4	Horizontal	41	41	41
Side 5	Horizontal	41	41	41
Corner 2-5	Vertical	17 1/16	16 15/16	17
Corner 2-6	Vertical	17 1/16	16 15/16	17
Corner 4-6	Vertical	17	16 15/16	17
Corner 4-5	Vertical	17	16 15/16	17
Diagonal Side 2	Top 2-5 to Bottom 2-6	44 1/4	44 1/4	44 1/4
Diagonal Side 5	Top 2-5 to Bottom 4-5	44 1/4	44 1/4	44 1/4
Diagonal Side 4	Top 4-6 to Bottom 4-5	44 3/16	44 1/8	44 1/8
Diagonal Side 6	Top 4-6 to Bottom 2-6	44 5/16	44 1/8	44 5/16

Container: CNU-520
Superimposed Load: 2430 pounds
Damage Incurred: None

Dimension Location	Dimension Orientation	Initially Unloaded (Inches)	Loaded One Hour (Inches)	Unloaded Post Test (Inches)
Side 2	Horizontal	42	42	42
Side 6	Horizontal	18	18	18
Side 4	Horizontal	42	42	42
Side 5	Horizontal	18	18	18
Corner 2-5	Vertical	19	19	19
Corner 2-6	Vertical	18 15/16	18 15/16	19
Corner 4-6	Vertical	18 15/16	19	18 15/16
Corner 4-5	Vertical	18 15/16	18 15/16	18 15/16
Diagonal Side 2	Top 2-5 to Bottom 2-6	46	46	46
Diagonal Side 5	Top 2-5 to Bottom 4-5	26	25 15/16	25 15/16
Diagonal Side 4	Top 4-6 to Bottom 4-5	45 7/8	45 7/8	45 7/8
Diagonal Side 6	Top 4-6 to Bottom 2-6	26	25 15/16	25 15/16

Container: CNU-521
Superimposed Load: 1660 pounds
Damage Incurred: None

Dimension Location	Dimension Orientation	Initially Unloaded (Inches)	Loaded One Hour (Inches)	Unloaded Post Test (Inches)
Quadrant 1	Vertical	49 1/8	49 1/16	49 1/16
Quadrant 2	Vertical	48 13/16	48 7/8	48 13/16
Quadrant 3	Vertical	49 1/16	49	49
Quadrant 4	Vertical	49 1/16	48 15/16	49

Container: CNU-526
Not Tested

Container: CNU-529
Superimposed Load: 3898 pounds
Damage Incurred: None

Dimension Location	Dimension Orientation	Initially Unloaded (Inches)	Loaded One Hour (Inches)	Unloaded Post Test (Inches)
Side 2	Horizontal	48	48	48
Side 6	Horizontal	23	23	23
Side 4	Horizontal	48	48	48
Side 5	Horizontal	23	23	23
Corner 2-5	Vertical	13	13	13
Corner 2-6	Vertical	13 1/8	12 7/8	13
Corner 4-6	Vertical	12 15/16	12 7/8	12 15/16
Corner 4-5	Vertical	13	13	13
Diagonal Side 2	Top 2-5 to Bottom 2-6	49 1/2	49 1/2	49 1/2
Diagonal Side 5	Top 2-5 to Bottom 4-5	26 1/4	26 1/4	26 1/4
Diagonal Side 4	Top 4-6 to Bottom 4-5	49 5/8	49 5/8	49 5/8
Diagonal Side 6	Top 4-6 to Bottom 2-6	26 1/4	26 1/4	26 1/4

Container: CNU-530
Superimposed Load: 4382 pounds
Damage Incurred: None

Dimension Location	Dimension Orientation	Initially Unloaded (Inches)	Loaded One Hour (Inches)	Unloaded Post Test (Inches)
Side 2	Horizontal	43 1/16	43	43
Side 6	Horizontal	36	36	36
Side 4	Horizontal	43	43	43
Side 5	Horizontal	36	36	36
Corner 2-5	Vertical	15 1/8	15 1/8	15 1/16
Corner 2-6	Vertical	15	14 15/16	14 15/16
Corner 4-6	Vertical	15 1/16	15	15
Corner 4-5	Vertical	15	14 15/16	15
Diagonal Side 2	Top 2-5 to Bottom 2-6	45 1/4	45 1/4	45 1/4
Diagonal Side 5	Top 2-5 to Bottom 4-5	38 7/8	38 7/8	38 7/8
Diagonal Side 4	Top 4-6 to Bottom 4-5	45 5/16	45 3/16	45 5/16
Diagonal Side 6	Top 4-6 to Bottom 2-6	38 15/16	38 7/8	38 15/16

APPENDIX 4

Interim Report of Test for MILSTAR Containers CNU-510/E CNU-518/E, CNU-519/E, CNU-529/E, and CNU-530/E.

29 April, 1992

Interim Report of Test for MILSTAR Containers CNU-510/E, CNU-518/E, CNU-519/E, CNU-529/E, and CNU-530/E

Interim report of test for qualification testing of the MILSTAR containers CNU-510, -518, -519, -529, and -530 are stated in the following pass/fail table. Testing was performed in accordance with the amended YJA test plan. The unamended test plan is attached. The mutually agreed upon amendments consist of: (a) Leak tests were to be performed at the beginning of the test series and after the drop testing, (b) Tests relating to handle hoisting fitting tie-down strength were to be performed on only the heaviest container - the CNU-510/E was the heaviest provided in the first container group; therefore, it was tested and (c) Test loads for the superimposed load test would be computed using height related formula of Fed-Std-101, Method 5016.1 without round-off to allow for possible container stacking height. In the following table, tests are listed in the order performed. Explanatory notes are provided where necessary.

Table 1. Summary Results of Test.

Seq	Test	510	518	519	529	530
1	Leak	P	P	P	P	P
2	Vibration	P	P	P	P	P
3	Cornerwise Drop	P	P	P	F(2)	F(2)
4	Edgewise Drop	P	P	P	P	P
5	Pendulum Impact	P	P	P	P	P
6	24" Flat Bottom Drop	P	P	P	P	P
7	Leak	P	P	P	F(1)	F(1)
8	Superimposed Load	P	P	P	P	P
9	Hoisting Fitting Strength	P	-	-	-	-
10	Single Hoisting Fitting Strength	P	-	-	-	-
11	Tiedown Strength	F(3)	-	-	-	-
12	Structural Integrity	P	P	P	P	P

P - Pass F - Fail

NOTE 1: Both CNU-529/E (0.12 psi/hr) and CNU-530 (0.054 psi/hr) exceeded the permissible leak rate of 0.04 psi/hr. Examination of the closure gasket with bubble forming soap solution leak detector was not sufficiently sensitive to indicate a leak for either container. Examination of both containers pressurized to their respective leak test pressures after injection of 10 in of water of Freon 12 by means of an electronic halogen leak detector indicated leakage at one or more locations in the closure gasket and one or more bottom corners impacted by cornerwise drop testing.

NOTE 2: As the halogen leak test indicated leaks at corners impacted by cornerwise drop testing for both CNU-529/E (corner 4-5) and CNU-530/E (corners 2-5 and 2-6) and visible container deformation in the proximity of welds that seal the container occurred only at impacted corners, leak test failure is attributed largely to cracked welds at corners caused by cornerwise drop testing. Other drop testing did not produce visible permanent deformation; consequently, container weld failure is not attributed to other drop testing.

NOTE 3: The CNU-510/E container is symmetrical in the base plane except for breather valve and relative humidity indicator, bears no marking or other distinguishing feature to indicate fore and aft directions, and has upper and lower handles virtually identical in appearance and design and without marking as to which may be the tiedown. Consequently, all handles were considered to have tiedown capability and were tested accordingly. The 3 g constraint load was applied perpendicular to all four container sides at the base with the required tiedown configuration for both the upper and lower handles. A summary of the tiedown strength test is listed in Table 2.

Table 2. Summary of Results of Tiedown Strength Test.

Seq	Load Applied to Container Face	Load (lbs)	Tiedown Failure
1	2	940	Lower, side 6, corner 4-6
2	6	780	Lower, side 6, corner 4-5
3	4	770	Lower, side 5, corner 2-5
4	5	880	Lower, side 6, corner 4-6
5	5	940(4)	Upper, none after 1 minute
6	6	930	Upper, side 5, corner 4-5 Upper, side 5, corner 2-5
7	4	630	Upper, side 5, corner 2-5
8	2	570	Upper, side 5, corner 4-5

NOTE 4: For 3 g constraint of the CNU-510/E container, the minimum required load is 942 pounds.

NOTE 5: Container identification numbering is: Side 5 contains relief valve and handles. Side 6 is opposite side 5. Side 4 is 90 degrees clockwise to side 5. Side 2 is opposite side 4.

Edward P. Moravec Jr., Physicist
HQ AFLC/LGTPM, DSN 787-4519

APPENDIX 5

Interim Report of Test for MILSTAR Containers CNU-516/E CNU-520/E, CNU-521/E, and CNU-526/E.

28 May, 1992

Interim Report of Test for MILSTAR Containers CNU-516/E, CNU-520/E, CNU-521/E, and CNU-526/E

Interim report of test for qualification testing of the MILSTAR containers CNU-516, -520, -521, and -526 are stated in the following pass/fail table. Testing was performed in accordance with the amended YJA test plan. The unamended test plan is attached. The mutually agreed upon amendments consist of : (a) Leak tests were to be performed at the beginning of the test series and after the drop testing, (b) Tests relating to like handle hoisting fitting tiedown strength were to be performed on only the heaviest container, and (c) Test loads for the superimposed load test would be computed using height related formula of Fed-Std-101, Method 5016.1 without round-off to allow for possible container stacking height. In the following table, tests are listed in the order performed. Explanatory notes are provided where necessary.

Table 1. Summary Results of Test.

Seq	Test	516	520	521	526
1	Leak	P	P	P	F(1)
2	Vibration	P	P	P	-
3	Cornerwise Drop	P	P	N/A	-
4	Edgewise Drop	P	P	N/A	-
5	Pendulum Impact	F(2)	P	N/A	-
6	24" Flat Bottom Drop	P	P	F(3)	-
7	Leak	P	P	F(4)	-
8	Superimposed Load	P	P	P	-
9	Hoisting Fitting Strength	P	P	F(5)	-
10	Single Hoisting Fitting Strength	P	P	F(6)	-
11	Tiedown Strength	P	-	-(7)	-
12	Structural Integrity	P	P	P	-

NOTE 1: When tested with handles adjusted as received, the CNU-526/E container leaked at both ends at a rate that prevented pressurization to the required 2.0 psig. A concave distortion in the plane of the top of the container cover was noted. The four corner latches were adjusted so that the handles formed an angle of 70 degrees from the vertical so that maximum latch draw resulted and the latches could be opened using the handles, but the container still could not be pressurized. Wrench tightening the closed latches so that corner mechanical stops and cover top and bottom bore allowed pressurization to 2.0 psig; however, the leak rate was too large to measure. When wrench tightened after latch closure to bearing of mechanical stops, the latches could not be opened using the handles. Due to leak test failure, the CNU-526/E container did not receive

further testing and was returned to ASD/YJA for corrective action.

NOTE 2: The CNU-516/E container failed due to shearing of the glue seam attaching the small cylindrical cushion pad that inserts into the base assembly top axial hole to the larger cylindrical cushion pads of the top cushion assembly. If the small cushion pad was intended to provide base assembly restraint in the horizontal plane, it failed to do so.

NOTE 3: The CNU-521/E drum failed the 24 inch flat bottom and four quadrant drop test due to subsequent leak test failure and the shearing of the glue seam bonding the small cylindrical cushion pad that inserts into the top hole of the EHF antenna riser to the larger cylindrical cushion pad of the top cushion assembly. If the small cylindrical cushion pad was intended to provide EHF antenna riser restraint in the plane perpendicular to its axis, it failed to do so.

NOTE 4: The CNU-521/E drum failed the post drop test leak test (leak rate - 0.076 psi/hr) due to deformation and opening of the roll formed seam attaching the drum bottom to the cylindrical body resulting from the four quadrant drops at the impact bearing areas. With injection of 2.1 inches of water of Freon and pressurization of the drum to 2.0 psig, a sensitive electronic Freon leak detector indicated leaks at each of the deformed bottom rim seam areas. The top closure did not leak. No other leaks were detected.

NOTE 5: When the CNU-521/E drum was loaded to 1896 lbs in the vertical or upright carrying position and hoisted by straps attached to four handles, 1, 2, 3, and 4, in a plane perpendicular to the axis for 5 minutes, handles 2, 3, and 4 incurred permanent deformation. Handles 2 and 4 were deformed to the degree that they will not retract flat against the container side. When loaded to 1885 lbs in the horizontal carrying position and hoisted by straps attached to the four handles, 5, 6, 7, and 8, in a plane parallel to the axis, handles 5, 6, 7, and 8 incurred permanent deformation and will not retract flat against the container side. While all handles are otherwise serviceable, MIL-STD-648, 5.8.2 Acceptance criteria, requires rejection if permanent deformation of any part of the hoisting or tiedown provisions or supporting structure occurs.

NOTE 6: During hoisting, handle 6 pulled from its socket on one side and deformed by opening.

NOTE 7: Due to failures for tests 9 and 10, the test drum was not considered suitable for test.

NOTE 8: For the CNU-521/E drum, test quadrants are numbered 1 through 4 in a clockwise direction with the breather valve

located between quadrants 3 and 4.

NOTE 9: For the CNU-521/E drum, handles used for upright carriage are numbered 1 through 4 in a clockwise direction around the drum axis in a plane perpendicular to the drum axis with the breather valve located between numbers 3 and 4. Handles used for horizontal carriage are numbered 5 above and 6 below handle 2 and 7 above and 8 below handle 4.

Edward P. Moravec Jr., Physicist
HQ AFMC(I)/ LGTPM, DSN 787-4519

1 Atch: Test Plan

APPENDIX 6

Interim Report of Test of Modified MILSTAR Container CNU-510/E: Tiedown Strength Test.

5 June, 1992

Interim Report of Test of Modified MILSTAR Container CNU-510/E: Tiedown Strength Test

The CNU-510/E welded extruded wall aluminum container employes an integral handle - tiedown configuration. Four handles located on one side, two on the base and two on the cover, with a corresponding configuration on the opposite side serve as carrying, hoisting, and tiedown provisions. Container features do not reveal which handles may be intended to serve a particular function or that the container may be presumed to have a fore and aft orientation. Container markings were not present to identify handle function or container fore and aft orientation. Consequently, the fore and aft tiedown constraint requirement for 3 g s container restraint was applied to all eight possible tiedown configurations during the initial test. Many of the handles failed by incurring permanent deformation which MIL-STD-648A, 5.8.2 Acceptance criteria explicitly states to constitute failure, or by being pulled from the plastic insert mounting socket on one site.

ASD/YJA requested a minor container modification and tiedown strength retest. The modification was to translate each of the handle plastic insert mounting sockets toward the handle interior by 1/4 inch. Untested 11.5 inch slot width handles and plastic insert mounting sockets were removed from CNU-518/E and CNU-519/E containers which have nominally identical handle provisions and mounted in the CNU-510/E container for retest. For the undeformed handle and plastic insert mounting socket, 1/4 inch translation toward the handle interior is the maximum that handle and socket fit will allow.

Results of the tiedown test of the modified CNU-510/E container are listed in Table 1 in the order performed. Explanatory notes are provided where necessary.

Table 1. Summary Results of Test of Modified CNU-510/E Container.

Seq	Load Applied to Container			Tiedown Failure		
	Side	Load (lbs)	Time (min)	Set	Side	Corner
1	6	940	1	Lower	5	4-5 and 2-5 (1)
2	5	940	1	Lower	6	2-6 and 4-6 (1)
3	2	750	0	Lower	5	4-5 (1 and 2)
4	4	880	0	Lower	6	2-6 (1 and 2)
				Lower	5	2-5 (1)
5	4	860	0	Upper	5	2-5 (1 and 2)
				Upper	6	2-6 (1)
6	2	920	0	Upper	5	4-5 (1 and 2)
				Upper	6	4-6 (1)

7	5	920	0	Upper 6	4-6 (1 and 2)
				Upper 6	2-6 (1)
8	6	760	0	Upper 5	2-5 (1 and 3)
				Upper 5	4-5 (1)

NOTE 1: Visible evidence of permanent deformation to the handle is present.

NOTE 2: Handle pulled from its socket on the interior side.

NOTE 3: Handle pulled from its socket on both sides and fell out. On its exterior side, container wall permanent deformation allowed the plastic insert retaining screw to slide out of captive hole and the plastic insert to rotate and shift.

NOTE 4: For 3 g constraint of the CNU-510/E container, the minimum required load is 942 pounds.

NOTE 5: Container identification numbering is: Side 5 contains relief valve and handles. Side 6 is opposite side 5. Side 4 is 90 degrees clockwise to side 5. Side 2 is opposite side 4.

Edward P. Moravec Jr., Physicist
HQ AFMC(I)/LGTPM, DSN 787-4519

APPENDIX 7

Letter, 12 May, 1992, Failed Leak Tests at AFPEA on MILSTAR Containers CNU-529 and CNU-530.

SVERDRUP TECHNOLOGY, INC.
TEAS GROUP

MEMORANDUM

To: Larry Wood, AFPEA
FAX 513-257-0231

Date: 12 May 1992

From: Ron Wilson, Eglin AFB

Subject: Failed Leak Tests at AFPEA on MILSTAR Containers CNU-529 and CNU-530

Per our telecon on 12 May 1992, the failure of MILSTAR containers CNU-529 and CNU-530 to pass the leak test when tested at AFPEA will be attributed to a gasket seating anomaly. This will be noted in the AFPEA test report and the two containers will be acceptable as tested.

As discussed, upon return to Eglin, the containers were leak tested three times using 100 percent helium gas at 2.0 psi and an inert gas detector and the test results were acceptable. Also, a dye penetrant test was conducted on each of the containers and no cracks could be located. The leak tests results on both containers were acceptable when tested at Eglin AFB both before and after AFPEA testing.

The rationale and applicability of using the container handles as the tie down restraints will be reviewed with the customer. I will keep you advised of the progress.

Your input and cooperation is appreciated.

RCW/paa